HJP BRICKS ONLINE ORDERING SYSTEM

ZIWEWE NYASHA DESIRE

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By

ZIWEWE NYASHA DESIRE

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Department of Computer Science and Information Systems in the

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Supervisor: Mr. M. Giyane

ABSTRACT

This project focused on the development and implementation of an online ordering system for HJP Bricks private Limited. The main aim was to eliminate some manual processes in the ordering and selling of bricks at the organisation. The feasibility study was done with major focus on technical, economic, and operational feasibility. Costs involved in the development, maintenance and use of the system were estimated and weighed against the benefits. The results of the feasibility study were satisfactory since the constraints were within the organisation and the developer's capacity. Risk analysis was also carried out and the results showed that the project was less risky. A project work-plan was developed following the favourable feasibility study and risk analysis. The project was planned where activity sequence and time allocation were determined. Using defined methodologies in data gathering, analysis of the system was carried out to determine if the organisation really need a new system. Information systems related problems were identified and also the weaknesses of the current system. The common problems affected data integrity, consistency, completeness and reliability of an information system at the organisation. The design of the solutions to the determined problems was done. All data-flows, processes, inputs, outputs and relations between entities in the new system were determined. The design includes system design, physical design, database design, architectural design and interface design. The high level design was converted into low level design and the design specifications were converted into working solutions. The solutions passed through different levels of testing from unit testing to integration testing. Different testing cases were determined and the system was tested to remove bugs. Verification and validation were done to determine if the right product was build and if it was built correctly. The system security mechanisms were formulated and some recommendations were given. For user training, a user manual was provided so that the use of the system will be easy.

DECLARATION

I, **Ziwewe Nyasha Desire,** hereby declare that I am the sole author of this dissertation. I authorize the **Midlands State University** to lend this dissertation to other institutions or individuals for the purpose of scholarly research.

Signature: …………………………………………. Date: …………………………………..

APPROVAL

This dissertation entitled **"HJP Bricks Online Ordering System"** by **Ziwewe Nyasha Desire** meets the regulations governing the award of the degree of **BSc Honours Information Systems** of the **Midlands State University,** and is approved for its contribution to knowledge and the literary presentation.

Supervisor's Signature: ………………………………………….

Date: …………………………………………………………..

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DEDICATION

I dedicate this work to my family members with sincere gratitude to brother Oziwell, sister Rejoice, sister Melody and Mr and Mrs E Munanga and my friends for working tirelessly to afford me the foundation upon which my achievement is built. These people are special for they could give consistency and solid support without giving up. I say special thanks to you all and may the dear Lord bless you.

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LIST OF ACRONYMS

ARR…………………………………………………………..Annual Rate of Return

CBA…………………………………………………….…….Cost-Benefit Analysis

CD………………………………………………………………Compaq Disk

CSV……………………………………………..……Comma Separated Values

DBMS……………………………………………….....Database Management System

DFD…………………………………………………….………Data Flow Diagram

EER…………………………………………....Enhanced Entity Relationship Diagram

FTP…………………………………………….……..File Transfer Protocol

HTML………………………………………….…Hyper Test Mark-up Language

HTTP……………………………….…………………Hyper Test Transfer Protocol

IP………………………………………………………...…Internet Protocol

IT……………………………………………….……….Information Technology

MSU……………………………………………….…....Midlands State University

PDF……………………………………………...……….Portable Document File

PHP……………………………………….....Personal Home Page Pre-Processor

R.O.I………………………………………….......……….Return On Investment

SQL……………………………………………….……Structured Query Language

USB……………………………………………………….Universal Serial Box

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CHAPTER ONE: INTRODUCTION PHASE

1.1 INTRODUCTION

This chapter will outline the aim of the research outlining the drivers of the system development process and the fore mentioned solutions. In this phase, the issues relating to information systems are outlined. The background information of the HJP bricks pvt ltd and its industrial environment are well outlined. The problem definition of the organisation in relation to information technology are included in this introductory phase.

1.2 BACKGROUND OF THE STUDY

The aim of this project was to develop an online ordering system of the HJP Bricks. The motives were driven from the information systems related problems at the organisation. The main focus was to automate the ordering of bricks and report generation. A computerised system was found as a suitable solution to the problems and weaknesses of the current manual system. The researcher found it necessary to develop a system that allow online ordering of bricks.

1.2.1 Background of the organisation

HJP is a brick selling company which was build and start working in August 2004. The name HJP was derived from the initials of the founders' names Honest and James Panganai. HJP Bricks is located in the Midlands Province in Gweru district under Mambo location. This company sells bricks of different types and sizes. The bricks include common burnt, sand lime, clay burnt and concrete bricks. The organisation went through a phenomenal evolution process. The company survived the times of economic hardships of 2008 when it was close to shut down. In 2008 the work-force was reduced to five people. HJP Bricks rebounced in 2009 and enjoyed a rapid growth and increased its work-force to thirty-five in 2017. Currently the organisation is building two plants in Harare and Bulawayo.

1.2.3 Organisational structure

According to Jacobides (2007), organisational structure shows the relationships, accountability and authority within a defined setup. Levels of authority determines the channels of communication, span of control and chain of command. There are many types of organisational structures which can be used by organisations. Types of organisational structures include functional structure commonly known as bureaucratic structure. In functional structure, the functions divide the company based on their specialty for example

production, marketing, human resources and Information Technology departments (Jacobides, 2007). More so there are divisional structures were the organisations' leaderships are structured according to different projects or products. There is also a matrix structure in which employees have multiple superiors and reporting lines. Workers report to a divisional manager and also have project managers for some specific projects. HJP Bricks adopted a functional structure where there are the production, marketing, finance and the Human Resource management departments. An Organisational structure is represented using an organisational chart. An organisational chart is a pictorial tool used to depict the organisational structure. The organisational chart for HJP Bricks is shown in fig 1.1.

```
                        DIRECTOR
                            |
              General
              manager
                            |
    ┌───────────┬───────────┼───────────┐
production   marketing   Planning     finance
manager      manager     Officer      manager
    |            |           |            |
  staff        staff       staff        staff
```
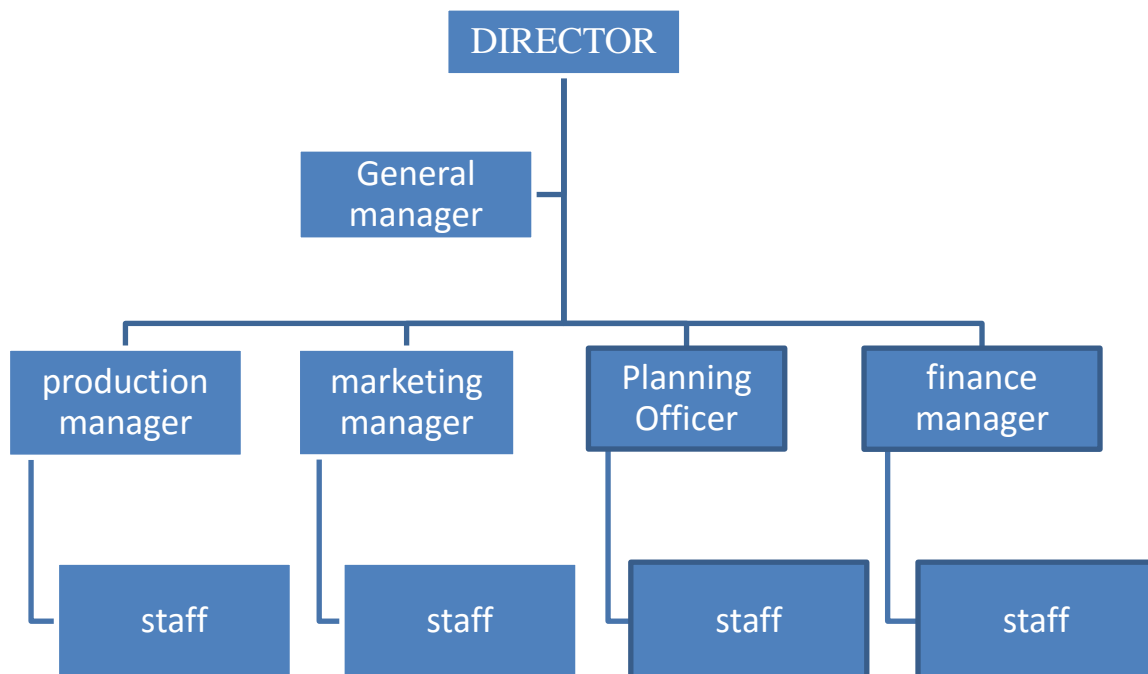
Fig.1.1 HJP Bricks Organogram

Source: Ozdem (2011)

1.2.3 Vision statement of the organisation

A Vision statement is defined as an account which shows the desired destination by an organisation in a specified time frame (Ozdem, 2011). A vision statement is used as a yardstick by an organisation. HJP Pvt ltd vision statement is to be the dominant figure in providing building material in the province and country as a whole.

1.2.4 Mission statement

Ozem (2011) defines a mission statement as a statement that represents the main driver of the existence of an organisation. HJP Pvt ltd mission is to provide quality and affordable building material through continuous improvement and working with other stakeholders in research and development so as to improve the quality of service in the building industry.

1.3 PROBLEM DEFINITION

A problem is defined as the difference between the desired state and the current state (Ellis and Levy, 2008). The HJP Bricks private limited is facing some information systems related problems such as delays, too much human errors and lack of communication with various stakeholders. These problems are common in acquiring, capturing, manipulating, storing, retrieving and presenting data. The organisation faces some problems such as the decreasing sales due to failure to deliver hot information to potential customers. In HJP Bricks, the ordering process includes many processes which require repeated communication back and forth. Also customers always need to be physically present when they need to order bricks and the system is slow. Too much inconsistence in records of sales sometimes due to arithmetic errors and this also result in loss of data and difficulty record tracking. Poor report generation to the director for assessment is a serious problem.

1.4 AIM

An aim can be defined as the main objective of a project (Miner, 2002). The aim of this project is to develop an online ordering system for the HJP Bricks private limited. The system will automate the ordering process.

1.5 OBJECTIVES

Objectives can be defined as some set goals of a course of action (Heldman, 2005). Objectives were used as the measure of success after the completion of the project. The project objectives were derived from the current information system needs of the organisation.

- To design a system that enable customers to order bricks online.
- To develop a system that allows the management to upload information on new products.
- To develop a system that provides ready-made quotations by updating cart before the transaction is done.
- To develop a system that allow audit trail to salesman by the manager.

- To create a system that allows stakeholders to send their suggestions and opinions concerning the operations of HJP.
- To develop a system that automatically generates order reports to the manager.
- To design a system that allows the director to blacklist untrusted customers.

1.6 Methods and Instruments

Instruments are the technologies which are going to be used in the development process including the development environment (Edward, 2003). Developers opt for different tools because of reasons such as experience, personal preference, availability and nature of the product. In this project preferred technologies include the following. Dreamweaver cs6 and PHP Runner are the coding environments used to write php, cascading style sheets (css), Hypertext mark-up language (HTML) codes. Xampp was used for database management in which Apache and MySQL services were the most needed. The operating system used is windows 8 on an HP laptop model 255. A chrome browser was used for testing and searching for online help. The security mechanism required an antivirus to protect the system in which AVG antivirus being the favourite. Internet connection was one of the most needed resources for research purposes.

In data collection, different methods were used. These methodologies are interviews, questionnaires and observations. The methodologies were used to collect qualitative and quantitative primary data. A detailed account of the methodologies is given in chapter three. Secondary data was collected on the table were pamphlets and the internet were the most used sources of secondary data.

1.7 JUSTIFICATION

Justification outlines the worthiness of the system in addressing the current problems and if it can add value to the organisation according to Cooper (2005). In justification, the system may increase the market base of HJP through web advertising, consistence in data capturing and record keeping. The system will reduce the risk of fraud at all levels of the hierarchy due to comprehensive data capturing and report generation as well as record keeping. Strict authentication on the system makes it more powerful in preserving the integrity, consistence and completeness of data. Audit trail will help in supervision of salesmen activities in database data modification. The system will cover a wide geographical area in spreading information about the bricks on sale. More so a reduction in human effort, error reduction and the generation of comprehensive reports with consistent format can justify the worth of the

new system. The manager can easily see the contribution to sales for all types of bricks. The system will notify the manager about bought products which are not yet taken by the customers. The level of bricks not collected will be provided in form of charts which allow him to notify customers in-order to free the space on the premise.

1.8 CONCLUSION

The background of the study, organisational structure of HJP Bricks private limited and the way it operates. Proposed solutions were outlined and justified in this chapter which shows that the system may be add value to the organisation. Given the aforementioned methods and instruments for executing the plan, a detailed plan may need to be carried out which is outlined in the next chapter. The main focus is on planning and stressing the main activities to be carried out and to determine their sequential order. The allocated time for each activity will also be shown in the form of a workplan and a gantt chart.

CHAPTER TWO: PLANNING PHASE

2.1 INTRODUCTION

Chapter one introduced this project as a whole. It also outlined information technology and communication related problems encountered by HJP Bricks. Problem definition outlined the need of a new system. To develop that system, a plan was needed. This chapter focuses on the project feasibility taking into account the organisational values and resources. The feasibility study was conducted and the results were positive. A risk analysis was also done and the results showed that the project is less risky. A work-plan will be outlined following satisfactory results of the feasibility study and the risk analysis.

2.2 BUSINESS VALUES

Steward (2006) mentioned that business values are the expected benefits or gains from a course of action taken in regard of the business. In this context the business values to be considered comes as a result of the operation of the new system. The significance of the system to the success of the organisation and also the attainment of organisational needs need to be analysed. The effects of the HJP Bricks online ordering system to both internal and external stakeholders is going to be determined in this chapter through cost and benefit analysis to see if there is a positive move or not.

The HJP Online brick ordering and selling system's anticipated gains are as follows:

2.2.1 Shareholder Values

Alexander and William (2011) define shareholders as the residual owners of the company who can claim profits as well as suffer loss. By the introduction of the new systems they must be better off for the system to be considered a success.

- Increase the market base through wide coverage which may increase sales.
- Efficiency in business processes which may widen the margin of safety.
- Appreciation of the value of shares on the market.

2.2.2 Employee knowledge

- The introduction of the new system may result in a raised motivation level of the workforce due to technological advancement.

- Employee workloads may be reduced because some of the activities which are currently done by them will be then taken by the system itself and the customers will sometimes do it themselves.

2.2.3 Channel Partner value

According to Steward (2006) a channel partner is a company or an entity that partners with a manufacturer or producer to market and sell the manufacturer's products, services, or technologies. This is usually done through a co-branding relationship. Channel partners may be distributors, vendors, retailers and consultants. The new system will add value to the current and future channel partners of the HJP Bricks in different ways.

- There will be smooth flow of information.
- There may be technological integration with channel partners which may improve business processes in terms of speed, accuracy and reliability.
- There may be value addition to the products and services which may increase profitability.

2.2.4 Customer values

- Throughput is going to increase because some of the processes will be eliminated such as sending enquiries and preparation of quotations since ready-made solutions will be available on the website.
- Response time in ordering will solely depend on the strength of user network and speed of the machines since queuing will be eliminated
- Customers do transactions on their own over the web and pay online which allow them to work on their time rather than to be limited by the premises' opening and closing of doors.

2.2.5 Supplier value

Suppliers provide raw materials and or finished products. They will benefit in the following manner.

- Just in time supply can be justified due to clear processing and communication.
- Suppliers will also benefit if HJP suppliers can sell more since they are the source of the products.

2.2.6 Managerial values

Managerial values are the anticipated benefits of the system to the management which comes as a result of the use of the new system (Steward, 2006). Some of the expected managerial benefits are outlined below.

- The management may gain trust from various stakeholders due to increased efficiency and effectiveness in HJP operations.
- Security will be increased since access to the system will be restricted for those without access privileges.
- The management can easily manage transactions since most of the work will be done electronically.
- There may be reduction in errors because of automation and at the same time the employment of data constraints in capturing details may help in managing datatypes and all information about an individual may lessen the burden to the management in handling those error corrections.
- It may reduce the amount of resources needed in terms of stationary and time and the requirements will be easily estimated long before which may reduce their planning efforts.
- Improved security, response time and consistence in the organisation concerning transaction processing through the use of private authentication credentials for customers and the management to protect data from unauthorised access.
- Reports may be generated so easily in a consistent manner.
- Transactional stationary costs may be saved significantly in the sense that e-resources are diminishable and it promotes simultaneous access.
- Auditing may be a great value addition element to the management since they can monitor database data modification.

2.2.7 Societal values

- If the system resulted in growing of the organisation, employment will be created which will benefit the local community.
- The society will benefit if the Greening of IT technology is followed.
- Creation of employment is a significant societal value.

2.3 FEASIBILITY ANALYSIS

According to Stuhlman (2006), feasibility can be described as the attainability of some objectives with given resources in a specified time frame. Feasibility study is concerned with the determination of the attainability of a project. Feasibility can be subdivided into operational, economic and technical feasibility.

2.3.1 Technical feasibility

This is more concerned with the capacity of the available technical resources and instruments in the development, maintenance and support the system in an effective and efficient way within a specified time period (Stuhlman, 2006). The power of the developer to come up with a right product at the right time using the available resources is a serious issue of concern in technical feasibility study. Technical feasibility can be categorised into two sub categories namely technical expertise and hardware and software constraints.

2.3.1.1 Technical Expertise

Heldman (2005) defined technical expertise as the level of technical knowhow in a project team. Project success has a bearing on technical expertise. This project requires enough knowledge in PHP programming language and MySQL. A range of skills are needed in interface designing, query settings and testing. Technical expertise stretches from the developer to the users. The ability of the developer to produce the required product in time within the budget can be used as a measure of technical success. The salesmen and the managers of the HJP Bricks are familiar in working with some computerised systems.

2.3.1.2 Hardware requirements

These are the development tools that are employed by the developer in the development and maintenance of the new system (Hay, 2003). Hardware are the physical tools that were used in the development process and are still needed maintenance. The organisation need to acquire in order to ensure that all the needed resources are available in time. For the success of the system there is need for computer hardware, electricity, software, internet connections and other consumables. The power source must be reliable that is less interruptions. A server is needed and one machine connected to the server in-order to access the system files. The system need to run on a 64-bit processor with at least 64 GB RAM and at least 500GB Hard drive. An external disk is needed for backup.

Table 2.1 Required hardware

Hardware required	Available	Quantity required
A server	Yes	
Hard drive	No	two
Computers	Some	two
Power supply	Yes	
UTP cables	No	100 metres
Scanner	No	one
Printer	Yes	

2.3.1.3 Software

At the HJP Bricks, some computers are running on windows XP operating system and Microsoft office 2007 which are relatively absolute. A modern operating system is needed such as windows 8 or later. Most new software versions have better functionality as compared to older versions so there is need to upgrade the versions that are used at the organisation.

2.3.1.4 Overview of technical feasibility

Technical feasibility was conducted with main focus on hardware and software requirements as well as technical expertise. The feasibility results showed that the project was technically feasible. The mentioned hardware requirements and software requirements were trusted and it was known that they can work together without integration problems. The developer is well possessed with the technical skills needed which showed that a useful product can be delivered within a specified time frame with least possible costs.

2.3.2 Economic feasibility

Economics is the study of scarcity (Yeates and Cadle, 2008). According to Georgakellos and Marcis (2009), with scarcity economic agents need to make choice since it is the situation where needs and wants are infinite whilst the available resources are finite. After making choice, the value of the next best forgone alternative is known as the opportunity cost. In this

project the budget constraint must be considered so that rational decisions can be made. It is more concerned with the economic costs benefits derived from developing and implementation of the new system by the organisation. The assessment is done through Cost-Benefit analysis in which benefits are weighed against costs.

2.3.2.1 Benefits

Benefits are the gains that are enjoyed by an organisation following a course of action (Horngren, Harison and Bamber, 2004). Benefits are put into sub categories namely tangible and intangible benefits.

a) Intangible benefits

According to Oliver and Horngren (2009), intangible benefits are the benefits which can not be quantified but sometimes can be indirectly given monetary value. They are difficult to measure but lack of these benefits will lead to significant costs to the organisation. Some of the intangible benefits are as follows;

- The use of a computerised system will may boost employee morale.
- Reduction in the margin of error such as arithmetic errors.
- Reduction in workloads for employees due to online ordering.
- Quality and consistent reports will be generated.
- Robust security to protect data through authentication, backup and validation.

b) Tangible benefits

Tangible benefits can be defined as the paybacks of a project that have a quantifiable value (Oliver and Horngren, 2009). They are usually given monetary values. The business may have some benefits from the use of the system. Table 2.2 shows the anticipated tangible benefits.

Table 2.2 Tangible benefits

Benefit	Year 0 US$	Year 1 US$	Year 2 US$
Reduction in stationary costs	2500	2500	2500
Reduction in storage costs	1500	1500	1500
Increased productivity	6000	6500	7000
Reduction in labour costs	3000	3000	3000
Total	**11300**	**13500**	**14000**

2.3.2.2 Costs

Horngren et al. (2004) define costs as the esteem that is paid to acquire, convey, accomplish or to attain something. The HJP Bricks online ordering system is associated with development and implementation. The expenses are grouped into tangible and intangible costs.

a) Tangible costs

Tangible costs can be defined as the expenses incurred during the course of a project that can be quantified (Oliver and Horngren, 2009). Tangible costs have absolute monetary values directly assigned to them. The business incurs some costs during the development and implementation of the system.

Intangible costs

According to Oliver and Horngren (2009), intangible costs are the expenses which can not be quantified but sometimes can be indirectly given monetary value. They are difficult to measure but existence of these costs will lead to significant reduction of the margin of safety.

2.3.2.2.1 Development costs

Development costs are the costs incurred during the development of the system. These include consumables, labour and raw materials.

Table 2.3 Development costs

Description	Costs (US$)
Labour	2000
Hardware requirements	11500
Software requirements	500
Total	**14000**

2.3.2.2.2 Setup costs

Setup costs can be defined as the incurred expenses during integration of the system to the operational environment. They include setting up of the hardware in the workplace, installation and file conversion.

Table 2.4 Setup costs

Description	Costs (USD$)
Physical setup	1100
Installation	400
File conversion	200
Total	**1700**

2.3.2.2.3 Operational costs

Operational costs are the costs that are incurred during the use of the system. They are directly linked to the system requirements such as labour, network subscription, maintenance to mention but a few.

Table 2.5 Operational costs

Description	Year 0 (US$)	Year 1(US$)	Year 2(US$)
Hardware maintenance	650	700	1200
Software maintenance	550	480	600
Stationary and computer consumables	1810	1320	1300
User training	1290	1000	400
Total operational costs	**4300**	**3500**	**3500**

2.3.3 Cost-Benefit Analysis

A cost-benefit analysis is a process by which business decisions are analysed (Boardman, 2006). The benefits of new system development are summed, and then the costs associated with taking that action are subtracted. Some consultants or analysts also build the model to put a dollar value on intangible items, such as the benefits and costs associated with using the new system and most analysts will also factor opportunity cost into such equations. Table 2.6 shows the cost-benefit analysis of the project.

Table 2.6 Cost and benefit Analysis

Description	Year 0 (US$)	Year 1(US$)	Year 2(US$)
Benefits	11300	13500	14000
Costs			
Setup costs	1700		
Operational costs	4300	3500	3500
Development costs	14000		
Total costs	**19000**	**3500**	**3500**
Net benefits	**(7700)**	**10000**	**10500**

2.5.2.1 Return on capital employed (ROI)

Return on investment (ROI) measures the gain or loss generated on an investment relative to the amount of money invested (Joshua, 2015). ROI is usually expressed as a percentage and is typically used for personal financial decisions, to compare a company's profitability or to compare the efficiency of different investments. The formula for calculating ROI and the calculation on this project is shown below.

$$R.O.I = \frac{(Total\ benefits - Total\ costs)}{Total\ costs} * 100$$

$$= \frac{(38800 - 26000)}{26000} * 100 = 49.23\%$$

The above calculation confirm a positive return on capital investment meaning that the project is favourable concerning this method of project appraisal.

2.5.2.2 Average rate of return (ARR)

Average rate of return (ARR) is the ratio of capital employed to average rate of return for an accounting period according to Joshua (2015). It can be calculated using the following formula.

$$\frac{Average\ profit}{Capital\ employed} * 100$$

$$\frac{\frac{(7700) + 10000 + 10500}{3}}{14000} \times 100$$

$$\frac{4600}{14000} \times 100 = 32.86\%$$

The project can be considered worth and taken since it showed a high average rate of return.

2.5.2.3 Payback period

Payback period can be referred to as the time it take for a project to breakeven and normally projects with a shorter payback period are preferred (Stuhlman ,2006). Basing on the above information the payback period can be calculated as follows.

Table 2.7 Payback period.

Year	Annual cash flows	Cumulative cash flows
0	(19000)	(19000)
1	11300	(7700)
2	13500	3600
3	14000	
4	3100	
5	3100	

The investment has a payback period of 1 year 7months which justify the worthiness of the project since the time needed to recover initial costs is very short.

2.5.3 Social feasibility

The HJP Bricks online ordering system may affect the society in various ways. Social feasibility mainly focuses on both negative and positive impacts of the system to the organisation and stakeholders (Cadle, 2008). Some of the foreseen impacts of the system are outlined as follows:

- The workforce is less likely to resist the system since preliminary results of the research shows that they are hungry for a new system.
- It may challenge other companies to improve their technology services.
- The project will create jobs for different qualified experts and general workers in the organization

2.5.4 Operational feasibility

Cadle (2008) defines operational feasibility as the process of determining whether the proposed system will become a reality in business operations. Concerning operational feasibility the system will be a success if coded and managed properly since it can substitute the current system and may give the expected benefits. Users may be provided with adequate training and supplementary documents to be provided so that they can operate the system without facing challenges. The system is going to be developed with user friendly commands,

sound and meaningful user interfaces. The system will allow customers to view available products in stock and place their order online and can also make payments anytime anywhere. According the gathered information the results are as follows:

- The company's directors showed interests in the development of a computerised system. They may provide maximum support to the use of the system. They promised to mobilise staff to increase commitment to work with the system provided the system is developed correctly.
- The system may be supported by the reliability of internet service providers as well as electricity supply.
- Using the system does not need technical expertise but just computer literacy since the users do not need to worry about internal functioning of the system but only results.

2.4 RISK ANALYSIS

Risk can be defined as the probability of the occurrence of an adverse effect and its associated impact (Adder, 2008). There are different categories of risks namely technical risks, financial risks and external risks.

2.4.1 Technical risks

The probability of loss incurred through the execution of a technical process in which the outcome is uncertain (Zahirul, 2005). Untested engineering, technological or manufacturing procedures entail some level technical risk that can result in the loss of time, resources, and possibly harm to individuals and facilities. Technical risk is measured as an expected value derived from prior experience that led to undesirable results. Technical risks that may evolve include the following;

- Malicious software such as viruses, logic bombs and Trojans.
- Input errors
- Fraud
- Employee harm
- Power cuts
- Software failure

2.4.1.1 Mitigation

- Backup facility for data to survive hardware and software failures.

- Strong validation scheme to check input.
- Audit trail mechanism was developed to ensure that the manager can see database activities of users.

2.4.2 Operational risks

Operational risk summarizes the risks a company undertakes when it attempts to operate within in a certain way (Ader, 2008). According to Zahirul (2005), operational risk is the risk not inherent in financial, systematic or market-wide risk. It is the risk remaining after determining financing and systematic risk, and includes risks resulting from breakdowns in internal procedures, people and systems.

2.4.2.1 Mitigation

- Adequate user training with compliment of user manual.
- Proper research was done for possible future changes and user requirements analysis.

2.4.3 Financial risks

Financial risk is any of various types of risk associated with financing, including financial transactions (Zahirul, 2005). The development of a new system is associated with some financial risks. Often it is understood to include only downside risk, meaning the potential for financial loss and uncertainty about recovering costs. The risk analysis was done and it showed that the project is associated with less financial risks.

2.4.3.1 Mitigation

- Appropriate budgeting schemes were used and need to be continuously revised.
- Cash-flow forecasts were done with the help with forecasting agents.

2.4.4 External risks

According to Adder (2005), external risks are the risks that are produced by a non-human source and are beyond human control. They are unexpected but happen regularly enough in a general population to be broadly predictable. In other words these are the risks that are external to the project and the project manager can not control. Good examples of external risks are changes in government legislation, changes in strategy from senior managers, and the economy.

2.4.5 Risk management

Risk management is the process of identification, analysis and acceptance or mitigation of uncertainty in investment decisions (Allan, 2011). Essentially, risk management occurs any time a project manager analyses and attempts to quantify the potential for losses in an investment and then takes the appropriate action in relationship to investment objectives and risk tolerance. Risk management starts with proper risk planning.

2.4.5.1 Risk planning

According to Allan (2011) risk management plan is a document that a project manager prepares to foresee risks, estimate impacts, and define responses to issues. It also contains a risk assessment matrix. Risks can be dealt with in different ways namely risk avoidance, mitigation, transfer and acceptance.

- Risk avoidance- these are the planned activities done to prevent or minimise the chances of the occurrence of an adverse effect. A deep stakeholder analysis to avoid resistance was carried out.
- Risk mitigation - A systematic reduction in the extent of exposure to a risk and/or the likelihood of its occurrence. Also called risk reduction. For example user involvement throughout the development process to avoid misunderstanding.
- Risk transfer – this is when the costs associated with risks are transferred to another entity so that the organisation will not bear the risks. Insurance was taken as the best way to transfer risks of hardware destruction.
- Risk acceptance - A risk management method used in the business or investment field. Accepting risk occurs when the cost of managing a certain type of risk is accepted, because the risk involved is not adequate enough to warrant the added cost it will take to avoid that risk.

2.5 STAKEHOLDER ANALYSIS

Stakeholders are the individuals groups that have direct interest in the business (Cameron, Seher and Grawley, 2010). According to Cameron et al (2010), stakeholder analysis is the process of identifying the individuals or groups that are likely to affect or be affected by a proposed action, and sorting them according to their impact on the action and impact the action will have on them this information is used to assess how the interests of those stakeholders should be addressed in a project plan, policy program, or other action. Stakeholder analysis is a key part of stakeholder management. Stakeholders include but not

limited to shareholders, management, customers, government, competitors, suppliers and employees.

2.5.1 Management

Management can be defined as the drivers of the organisation who plan, lead and control organisational activities (Cadle and Yeats, 2008). The management will be better off as per results of the research. Managers have a clear and accurate report on audit trail, sales, orders and user management. Since the introduction of the new system will result in costs reduction and sales increase this means the profits will go up. Profitability is used as a strong measure of business success. Employee motivation as a result of an automated system will allow the manger to hold a wide span of control.

2.5.1.1 Negative impacts

- The management are likely to face some novel challenges as a result of using the new system. This will require extra effort.
- Management may face resistance to change from employees.
- Change management maybe a tough task for the management.
- There is need to change the strategic plan.

2.5.2 Employees

Employees are the day to day workers who frequently interact with the new system (Fleming, 2005). As per research, employee work will be reduced because of automation. More so increase in profitability may strengthen their bargaining power for higher wages.

2.5.2.1 Negative effects

- Some employees may feel insecure since some of their responsibilities will be taken by the system.
- Some employees are likely to lose their jobs.
- There is also need for realignment in the work place which may demotivate other employees.

2.5.3 Customers

According to Faria (2001), customers are one of the most important stakeholders who are seen as the cash cows of the organisation. Due to the introduction of the online ordering system, customers' effort during the ordering process may be reduced. Some processes that needed more physical effort will be eliminated by the system such as sending enquiry, wait

for quotation and then place order. Customers will get ready made quotations by just adding products to a shopping cart. Customers will do orders with the comfort of their homes so they are saved on transport costs. They are also able to manage their orders.

2.5.3.1 Negative effects

- Some customers do not have internet access so it will be a challenge for them to use a new system

2.5.4 Shareholders

Shareholders are the owners of the business capital. They are categorised into ordinary and preference shareholders. Ordinary shareholders can be defied as the residual owners of the business (Faria, 2001). Preference shareholders have a first preference in receiving dividends over ordinary shareholders. Shareholders have interest in business since they are worried by their capital and profitability since they share profits or losses. The results of the research show that the system will reduce costs and widen the margin of safety. This guarantees profitability. Their business will improve in technology which will make it easier for integration and majors. The market share values of their shares will go up in the stock exchange.

2.5.4.1 Negative impacts

- The introduction and maintenance on the new system will require extra funding which will reduce their dividends in the short term.

2.5.5 Suppliers

Suppliers are the sources of raw materials, finished and semi-finished products (Edward, 2003). HJP Bricks buys raw materials and some bricks from suppliers such as Simason Bricks and Sino. If the use of the new system results in increased sales, it means also HJP Bricks will require more inputs from its suppliers which will increase their sales.

2.5.6 General conclusion

Stakeholder analysis was done to determine positive and negative impacts of the new system to different stakeholders. It shows that stakeholders have different interests in the business and also the impacts of the systems to them are different. From the above analysis one can conclude that the system will leave all stakeholders better off since the value of the positives outweighed the negative impacts.

2.6 PROJECT WORK PLAN

A project work plan is a part of project management which shows project activities with their associated durations. A work-plan shows the interdependence and precedents of activities in a project (Harold, 2003). When developing a project work plan there is need to subdivide the project so that the order in which various activities are taken can be clear and also time allocation.

The work plan for this project is shown below.

- analysis

    This concerned with various activities and structures in the organisation and how the new system will integrate with the current system. If the results of the analysis are not clear the project's objectives need to be revised.

- Designing

    This is where the specification are taken by the designer and try to produce how the product may look like and how information will flow into, out and within the organisation.

- Coding

    This is where code snippets are developed basing on low level designs to produce functional solutions.

- Testing

    Validation and verification processes are done at this stage in which the tester asks himself if he is building the right system and if the system is build right. More emphasising user specifications.

- Training

    The organisational staff require adequate training so that they can easily adapt and interact with the new system.

- Implementation

    This is when the actual product is introduced into the working environment and configured.

- Review meetings

    These meetings are held between the management, developers and other users to determine the progress and success of the project.

Table 2.8 Project work plan

Activities	Starting date	Ending date
Proposal	01-03-2017	31-03-2017
Introduction	01-04-2017	28-04-2017
Planning	01-05-2017	30-05-2017
Analysis	01-06-2017	30-06-2017
Designing	01-07-17	31-07-2017
Coding	01-08-2017	30-09-2017
Testing	01-08-2017	16-110-2017
Implementation	01-10-2017	17-10-2017

2.6.1 Gantt chart

According to Fleming (2005), a Gantt chart is an activity bar chat indicating scheduled activity dates and durations frequently augmented with activity floats. The afore mentioned data can be represented by a Gantt chart as follows showing time allocation from the start of the project
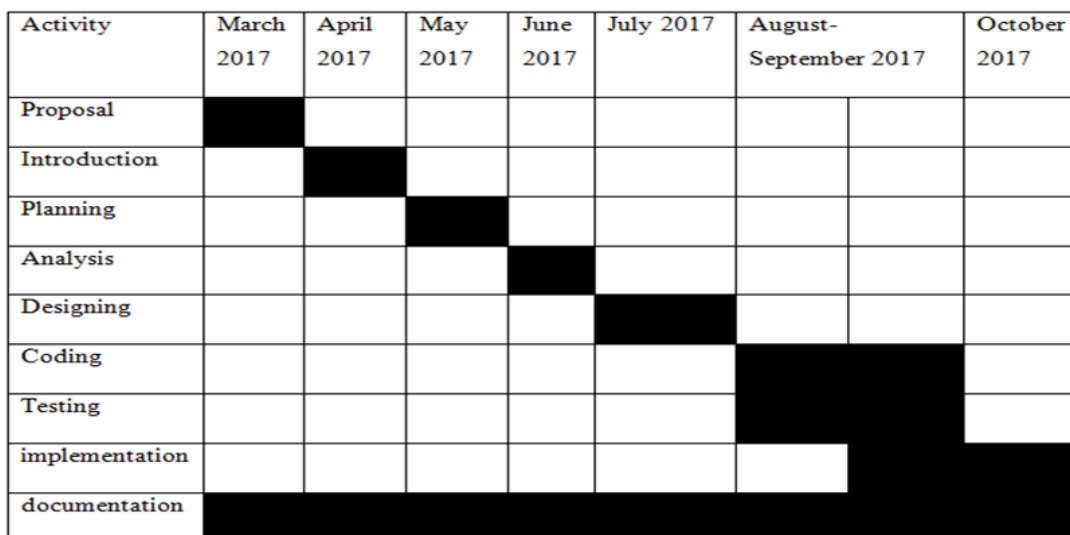
Fig 2.4 Gant chart of the project

Project activities are going to be carried out in a sequential order since they are depended on each other. Most activities will not start before the completion of their preceding activities although there are some activities that need to be carried out concurrently such as coding and testing. Documentation is an on-going process from introduction to maintenance.

2.7 CONCLUSION

In conclusion, the feasibility of the project was determined and the results showed that the project can move to the next stage. Various feasibility areas such as economic, social, technical feasibilities showed positive results. Risk analysis determined the likeliness and impact of some adverse effects to the organisation. The cost benefit analysis showed results which were well above the break-even point and this supports the worthiness of the project in adding value to the HJP Bricks pvt ltd. The risk values show that the project is less risk. This chapter outlined the overall plan of the project mentioning various activities that were carried out. The order and time allocation of the activities were outlined which gives a clear picture of the structure of the project. Project planning was followed by the analysis of the current system. The next chapter clearly outlines the analysis which was done. Data gathering methodologies were used to fetch both primary and secondary data in-order to analyse the system. The main aim was to determine the input, output and processes involved in the system.

CHAPTER THREE: ANALYSIS PHASE

3.1 INTRODUCTION

The previous chapter was focusing on planning. Its output was taken as input by the analysis phase. Planning stage determined the feasibility of the project in terms of economic, social and technical aspects and the results were satisfactory. The analysis of the existing system which mainly focused on current processes and their sequence, the flow of information and its weaknesses were outlined. Research is the key to understanding the aspects in the organisation so this chapter outlined the information gathering methodologies used. Basis for choice among alternatives on the method of coming up with a new system and its justification was mentioned in this chapter.

3.2 INFORMATION GATHERING METHODOLOGIES

Information gathering methodologies are the strategies and methods for obtaining necessary information about the problems and needs of the research (George, 2012). Different methodologies were used to obtain information from different stakeholders including customers, workers, the management and Information Technology personnel. This was done in order to have information from different angles of view and try to eliminate the effect of bias. These methodologies include questionnaires, interviews and direct observation.

3.2.1 Questionnaire

A questionnaire is a question bank containing structured questions which is handed to a responded that can feel in his time and then the researcher will later collect them and compile the outcome (George, 2012). It can contain both closed questions and open ended questions. Closed questions are used to have a concrete answer where a responded chose among alternatives. Open ended questions allow the responded to further explain in detail for better understanding. The questionnaires were deployed to the aforementioned stakeholders and then collected the answers for analysis. They offered the following advantages and disadvantages.

3.2.1.1 Advantages
- Questionnaires responses were relatively easier to analyse.
- They allowed the respondents to take time in answering rather than rushing to answer misunderstood questions because they answered without the researcher waiting.
- They consumed less time even the target population was bigger.

- They allowed the respondents to answer some relatively sensitive issues which they can not talk direct to the researcher.

3.2.1.2 Disadvantages

- When some questions where omitted, it became more difficult for the same responded to answer those questions.
- Questionnaire made it difficult to not allow further probing for explanation or asking for clarity if a question is not understood.
- Stationary consumption was relatively high.
- Delays resulted because different stakeholders answer them at different times and some of them answered in the last hour and some ignored.

3.2.1.3 Results

The researcher was provided with deep information on how the reports are generated. This was vital since the information is difficult to obtain using other methodologies as an outsider.

3.2.2 Interviews

George (2012) defined an interview as a conversation between the interviewer and the interviewee where questions are answered and answered for research purposes. These include face to face one on one or a group interview. The researcher used one on one interviews for different stakeholders including the receptionist, management and regular customers of HJP suppliers. The researcher chose to use interviews because they offer the following advantages although some few disadvantages.

3.2.2.1 Advantages

- They promoted instant two way communication which was relatively faster for that small sample.
- Interviews allowed the interviewer to learn from gestures and postures which enhanced a deep understand.
- They also allowed the interviewer and interviewee to probe for further explanation where they needed enough understanding.

3.2.2.2 Disadvantages

- Some offices were inaccessible which limited knowledge acquiring.
- Some interviewees felt insecure and didn't give sensitive information.

3.2.2.3 Results

During interviews, the interviewer further information which shows positive relationship with the outcome from questionnaires. Processes involved in the system are time consuming. The results showed that the new system is really needed.

3.2.3 Direct observation

Direct observation is also called an observational study where the researcher visits the operational environment to personally acquire information (George, 2012). The researcher visited HJP premises to collect information whilst operations are done normally on day to day basis. This was employed to complement questionnaires and interviews. Observations have their own advantages and disadvantages as follows.

3.2.3.1 Advantages

- They addressed problems associated with responded bias as the stakeholders were unaware that they are under observation so they performed normally.
- They were more appropriate where it was difficult to use interviews and questionnaires.

3.2.3.2 Disadvantages

- Outcome solely depended on the ability of the observer.
- It was difficult to observe all areas such as the actual processing of a system.

3.2.3.3 Results

Direct observations were used and contributed their advantages to form a combined advantage. Limitations of one methodology were covered up by its compliments. Use of these methodologies gave the researcher a better understanding of the system in which the analysis are outlined below. Generally observations results showed the system is slow in processing orders and it include too many processes.

3.3 Analysis of existing system

Using the information gathered, it was clear that HJP suppliers are a leg behind concerning modern technology. The organisation uses a manual system in capturing, processing, storing and disseminating information although they have few computers in their premises. The receptionist, sales person and the management have computers on their desks were they keep some files and share these files using memory sticks.

When a customer places an order, they record it manually. After a transaction has been made, the sales person record it in the computer. The soft copy and the hard copy are then sent to the management for reporting. If that same customer place another order, the sales person checks in the computer and if records for previous order which was not delivered. The information is send to the manager who then determine if the customer is worth to receive a credit. Less trusted customers only buy with cash.

3.3.1 Inputs
- Customer details
- Enquiry
- Order details
- Stock details

3.3.2 Processes
- Customer registration
- Ordering
- Stock adding
- Order processing
- Payment processing

3.3.3 Outputs
- Customer details
- quotation
- Order details
- Payment details
- Sales details

3.4 Process analysis
Dennis (2011) defines process analysis as the process of conveying the details of how change takes place through a series of interconnected steps. In this case, the researcher is concerned with transaction processes and managerial processes that take place at HJP organisation. Processes can be represented using an activity diagram as follows.

3.4.1 Activity diagram

An activity diagram is a diagrammatical representation of workflows in stepwise activities that shows concurrency, choice and cycles (Ader, 2008). Fig 3.1 is an activity diagram of HJP Bricks current system.
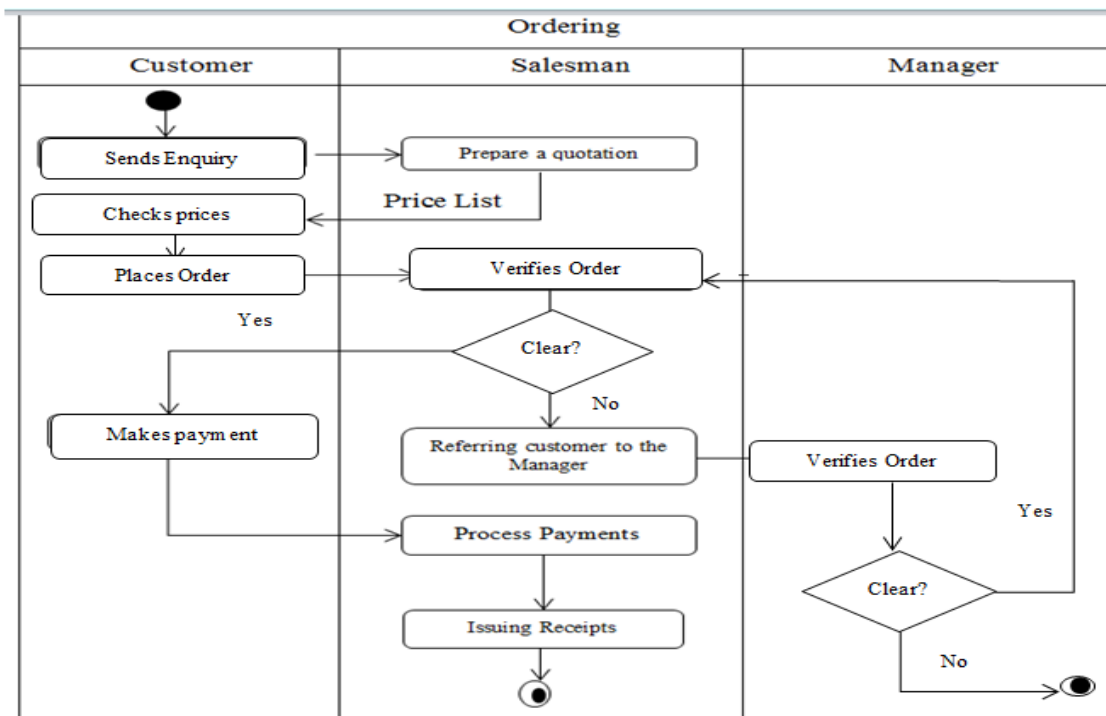

Fig 3.1 Activity Diagram of the current system

3.5 DATA ANALYSIS

Data analysis is the process of determining the type of data and the direction of flow of data from process to process and its storage as agued by Ader (2008). This illustrates the relationship between different processes and their associated data and data storages. In the dataflow diagram the interconnection of processes and their sequence are illustrated. Data analysis can be shown by using data flow diagrams and context diagram as shown below.

3.5.1 Context diagram

According to John (2000), a context diagram is a high level diagrammatical representation of a system which shows the boundary between the system and its external environment. It also defines how the external entities interact with the organisation and inputs and output to and from the external environment. The context diagram of HJP suppliers is shown in fig 3.2.
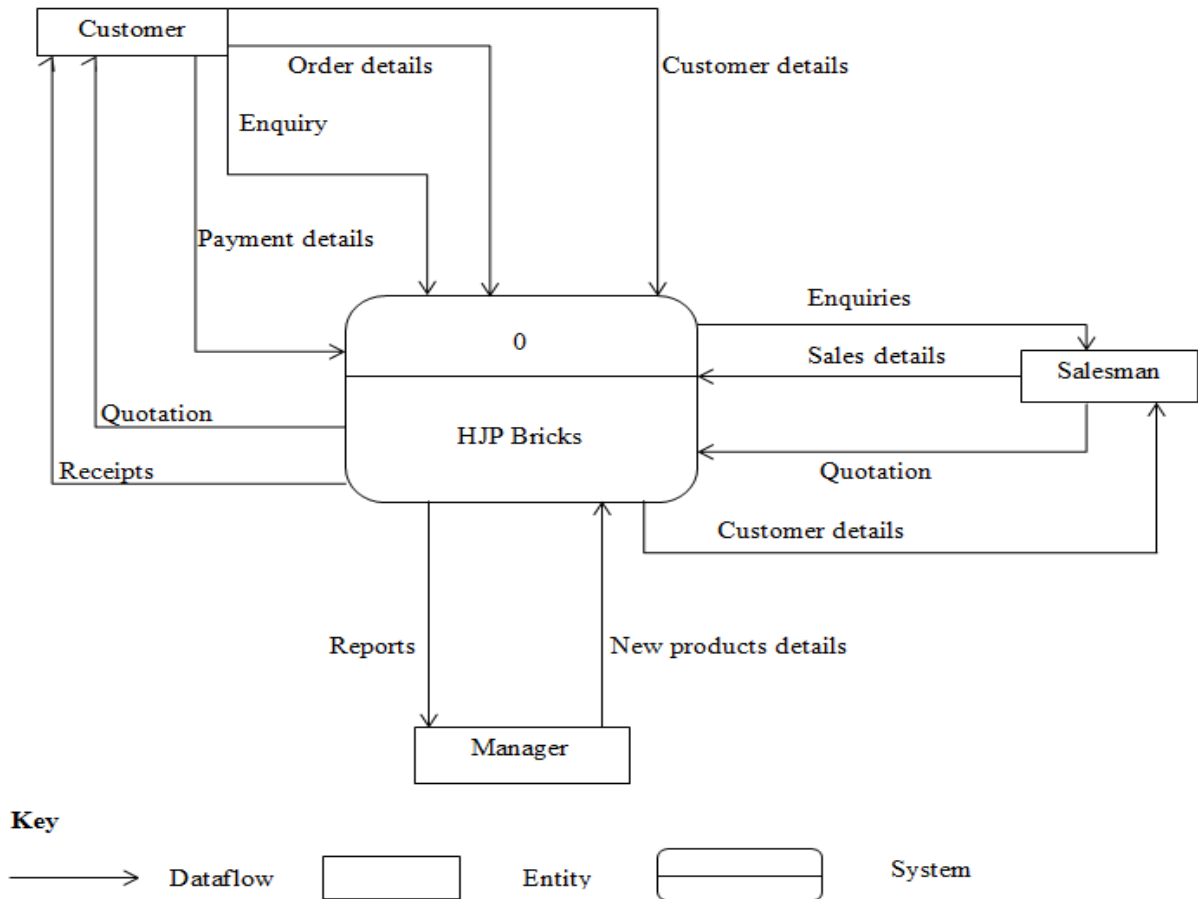
Fig 3.2 context diagram of the existing system

3.5.2 Dataflow Diagram

A dataflow diagram (DFD) is a diagrammatical representation of data channels, related processes, data sources and data sinks (John, 2000). Data channels marks the source and destination of data with directions being shown, data sources are usually entities who provide an organisation with data and the data sinks marks the final destination of data usually files. The data flow diagram of HJP suppliers is illustrated below.
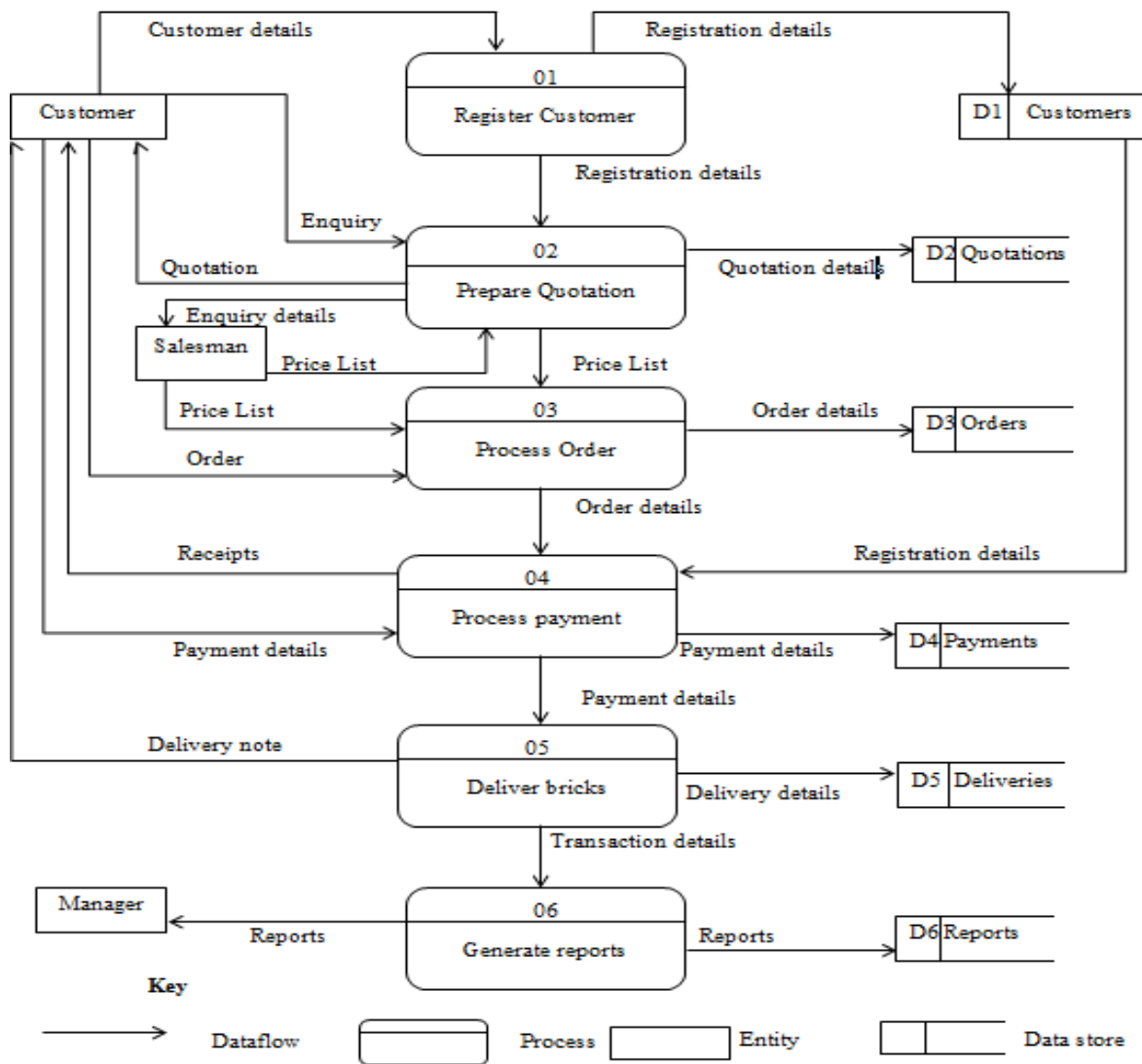
Fig 3.3 Data flow diagram

3.6 WEAKNESSES OF THE CURRENT SYSTEM

A weakness can be defined as the difference between the current state and the desired state. HJP suppliers' manual system has some weaknesses which were identified during information gathering. Some of the main weaknesses are outlined below.

- Inadequate security on sensitive data which lead to unauthorised access and loss of important information.
- The manual system is very slow in processing transactions
- Poor communication system between regular customers and the organisation
- Difficulties in tracking applications, registration and previous transactions in time of need.

- Most of the processes are labour intensive.

3.7 EVALUATION OF ALTERNATIVES

To come up with a new system in an organisation, a decision must be made on which alternative to put resources. There are generally three alternatives that give reach to a new system namely outsourcing, improvement of the existing system and in-house development. These alternatives are given in detail below.

3.7.1 Outsourcing

Baldwin (2006) defines outsourcing as a strategy that is used by organisations in acquiring a new system which involves hiring of specialists in the field of software development and give them a contract. Project planning, control and product delivery are done by the external project manager. A ready-made system can be bought from the market which is called off-the-shelf system development which is a type of outsourcing. There is also total outsourcing where an external developer is given a contract to develop a customised system under their own roof. Total insourcing can be described as contracting a system developer from outside who then develop a system under the customer's roof. Advantages and disadvantages of outsourcing are outlined below.

3.7.1.1 Advantages of outsourcing

- Outsourcing offloads workload from the internal personnel to outsiders.
- Outsourcing is relatively faster in delivery of a system since the work is given to specialists with experience and skills and their focus will be on the system development.

3.7.1.2 Disadvantages of outsourcing

- There may be communication, coordination and participation problems if a system is developed away from the customer.
- More competent developers are relatively expensive to contract.
- There may be maintenance problems since the organisation will highly dependent to the external developer.
- Cultural problems may result, the producer and the customer may have different norms and belief which makes it difficult for the developer to understand and adapt to the organisational culture.

- If the external developer lack trust may leave vulnerabilities to the system for unethical aim such as hacking.

Due to the following disadvantages, the developer has removed outsourcing from development candidates. The value of the disadvantages has outweighed the merits so the developer will go on to analyse improvement of the existing system and in-house development.

3.7.2 Improvement

Improvement is the modification of the already existing system. The source code of the existing system is altered to add or change functionality and appearance by a programmer who is familiar with the language used. This will be easy if the existing code is well arranged and commented properly. It has some advantages and disadvantages as follows.

3.7.2.1 Advantages of improvement
- It a faster method in delivering services to the user provided the existing code is clean since documentation of the system will be readily available.
- Less costs to be incurred as compared to other methods.

3.7.2.2 Disadvantages of improvement
- Some of the weaknesses in the existing system may be incorporated in the new system.
- It is difficulty to work with code that has been by another programmer so it efficiently works if the core programmer did not change.
- Problem tracing and fixing will be difficult which will be costly in the long term.

3.7.3 In-house development

According to Brian et al (2009), in-house development is a strategy when internal existing personnel develop a new system. The developer and end users belong to the same organisation. The development methodologies are determined by the organisational standards. This has some advantages and disadvantages as outlined below.

3.7.3.1 Advantages of in-house development
- System maintenance will be cheaper and faster in the long term since the developers will be readily available unlike in the case outsourcing where the organisation will over rely on external developer.

- Effective and efficient stakeholder analysis especially the internal hence reduced risks of system rejection at the end.

- Using existing personnel who are under salary will be relatively cheaper.

- Effective communication, coordination and cooperation since the development will be carried out under the roof of the organisation.

- Internal developers usually offer better user training which will lubricate acceptance and diffusion of a technology.

- Low chances of facing integration problems with existing software since internal personnel possess adequate knowledge.

3.7.3.2 Disadvantages of in-house development

- In-house developers may lack some specialised skills which will deter quality and speed of development.

- Development may greatly affected by internal politics.

- If users lack trust towards the internal team, resistance to change may greatly affect continuity.

3.7.4 Decision

Basing with the above evaluation of three alternatives, the researcher preferred to use in-house development because of the following reasons.

- Upgrading of the existing system applies when there was already a working computer system so in this case HJP suppliers are using a manual system.

- In-house development promotes great understanding between the organisation and the developer which enhance cooperation and coordination.

- Maintenance will be easier in case of in-house development.

Table 3.1 Costs of alternatives

Alternative		Costs (US$)	Total costs(US$)
In-house development		14000	<u>14000</u>
Outsourcing	Transport costs	200	
	Contractual costs	1000	
	Development costs	15000	<u>15800</u>
Improvement		15600	<u>15600</u>

In-house development was found as the best solution. This is because it is better than others concerning qualitative benefits as well as being quantitatively cheaper.

3.8 REQUIREMENTS ANALYSIS

Requirements analysis is a process of determining the actual expectations of the system as mentioned by Hay (2003). The support which will be given by the system to the organisation is the main focus. Needs of various stakeholders which must be satisfied by the system are outlined at this stage. The new system is expected to meet the following.

- Improvement in the registration in terms of speed and efficiency.
- Better record keeping which facilitate easy tracking of the records.
- Provide accurate reports with visual aids.
- Enhanced business to customer communication and customer relationship management.

3.8.1 Functional requirements

According to Dhillon (2006), functional requirements usually point to the capabilities of the system in performing business processes. Weaknesses of the existing system gave a guide to the required functionality basing on the business processes at HJP suppliers. This comprises of calculation modules, user support and the management support. Customers will register, manage account, place an order, manage order and make payment to approved orders. The admin will add notices, manage users, accept or reject order, add stock and view reports or sales.

3.8.1.1 Use case Diagram

A use case diagram is a behaviour diagram that is used to describe system actions (use case) that are performed by that system according to Gemino and Parker (2009). Each and every case should provide observable results relating to various stakeholders. In other words it is a diagrammatical representation of relations of processes and associated actors within a system or subsystem. Fig 3.4 is a use case diagram of the current system of the HJP Bricks pvt ltd.
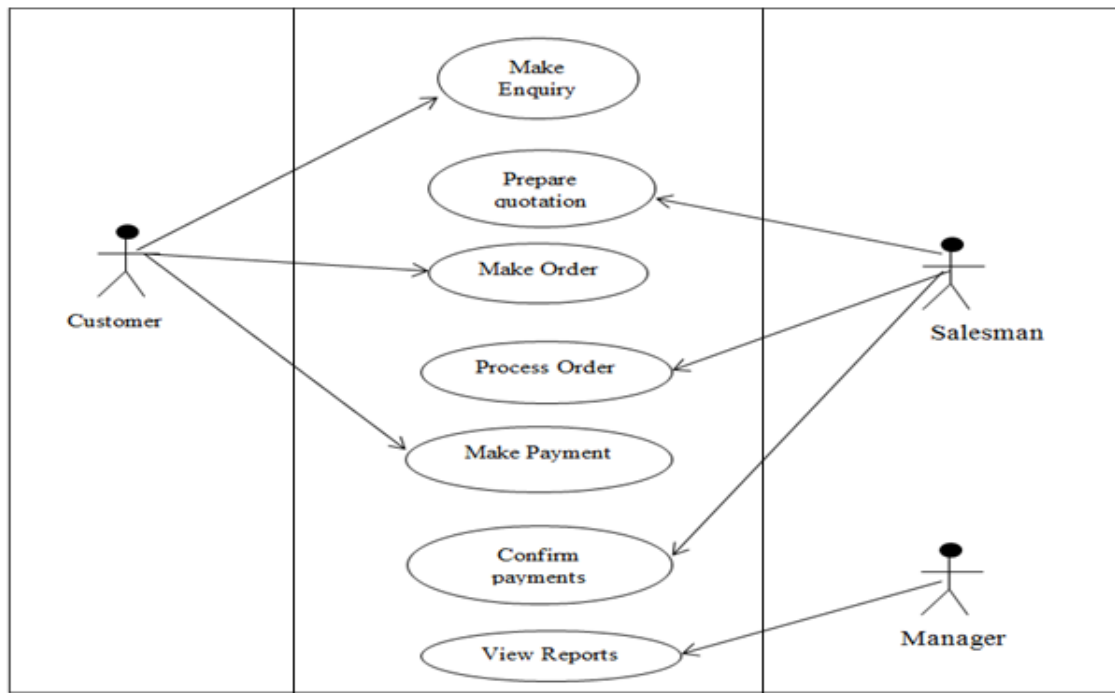
Fig 3.4 Use case diagram

3.8.1.1 Maintenance

Maintenance is an on-going process which is oriented at locating and fixing errors as they occur and make the system adapt to new business changes as argued by Dhillon (2006). The system must be flexible enough to make maintenance easier. Other users must not be allowed to access the system they must only be provided with data that allow them to do their day to day work. Technical user manual will be there to help the maintenance personnel in accessing the system.

3.8.2 Non-functional requirements

Non-functional requirements are the constraints that must be covered by the system. They include processing speed, ease of use, design and communicativeness. The following are some of the aspects need to be addressed on non-functional requirements.

3.8.2.1 Usability

- The system must promote easy of navigation.
- It must be communicative that is the naming of commands and menus must be understandable.
- User friendliness must be prioritised.

3.8.2.2 Error handling

- The system must handle errors in data capturing that is it must alert the user with a good response in case of an error.
- Calculations must be done in such a way that they represent reality in business processes such as negative values for stock must be forbidden and when the warehouse is out of stock, customers must be alerted.

3.8.2.3 Security issues

The system must offer security functionality through:

- Access levels- different users are restricted to other views that is everyone is presented with his own functional level data.
- Data capturing must ensure that the logged user is the one who is recorded.
- Use of passwords to give privilege in data access
- Users are restricted from accessing the system files.

3.8.2.4 Efficiency and throughput

Efficiency is the measure of input output ratio. An efficient system requires less resources and effort to deliver some functionality than inefficient ones. Throughput is the count of transactions that are processed at a given time. The system must:

- Improve the speed in transaction processes.
- Promote concurrency in registration and making order.
- Reduce human effort and consumables such as stationary consumption.

3.8.2.5 Technical constraints

Throughout the development process, technical experts are needed so as to conquer technical problems.

- More technical experts are needed to support the development of modules and system testing.

- Maintenance of the system needs at least one person who was involved in the development of the actual product.

3.9 CONCLUSION

The analysis phase clearly outlined the weaknesses of the existing system, choice among development alternatives and requirements of the system. This chapter shows what the new system must address and what should be done. Through in-house development, the next chapter will show the design specifications and he structure of the actual product outlining interface design, database design and physical setup. Using the gathered data the developer will effect choice to address mention problems and requirements.

CHAPTER FOUR: DESIGNING PHASE

4.1 INTRODUCTION

The previous chapter mainly focused on analysis of the existing system and information gathering methodologies and analysing the system. This phase focuses on various designs namely database, architectural, system, interface and physical design. The physical architecture setup will be outlined in this chapter. Modified context and dataflow diagrams will also be presented. The interfaces are also designed which meet the functional requirements of the HJP Bricks online ordering system.

4.2 SYSTEM DESIGN

System designing can be defined as determining the system components which include architecture, modules and interfaces that may provide the required functionality (Whitten, Brentley and Dittman, 2004). The main objective is to develop an effective and efficient system which is reliable and easy to maintain.

- Efficiency- an efficient system use less resources and time with minimum effort from the user.
- Effective- effectiveness deals with fitness for purpose producing the most desirable results. A well designed system must be effective enough in meeting user requirements.
- Maintainability- this deals with the ease of modification, integration and portability. A well designed system is easy to use in different platforms and it allows the integration of new modules.
- Reliability- reliability is all about the availability of the service when it is needed and its consistency in producing desirable results.

4.2.1 Description of the system

The HJP Bricks online ordering system allows customers to register online and use their credentials to access their accounts. The user cart allows them to manage their orders and it allows reversal action. The sales manager will view the pending orders and the payment methods then decide to confirm order so that the transaction will proceed or to reject. If the order is confirmed, it then moves to delivered orders. The salesman will see the sales level in form of bar chats as well as the stock level. Users are also notified is bricks are not stocked so they can pay for them they can just place an order so that the sales person will decide the right level to buy from manufactures.

4.2.2 Context diagram of the system

According to Alexander (2011), a context diagram is a high level diagrammatical representation of a system which shows the boundary between the system and its external environment. It also defines how the external entities interact with the organisation and inputs and output to and from the external environment. The context diagram of HJP suppliers is illustrated in fig 4.1.
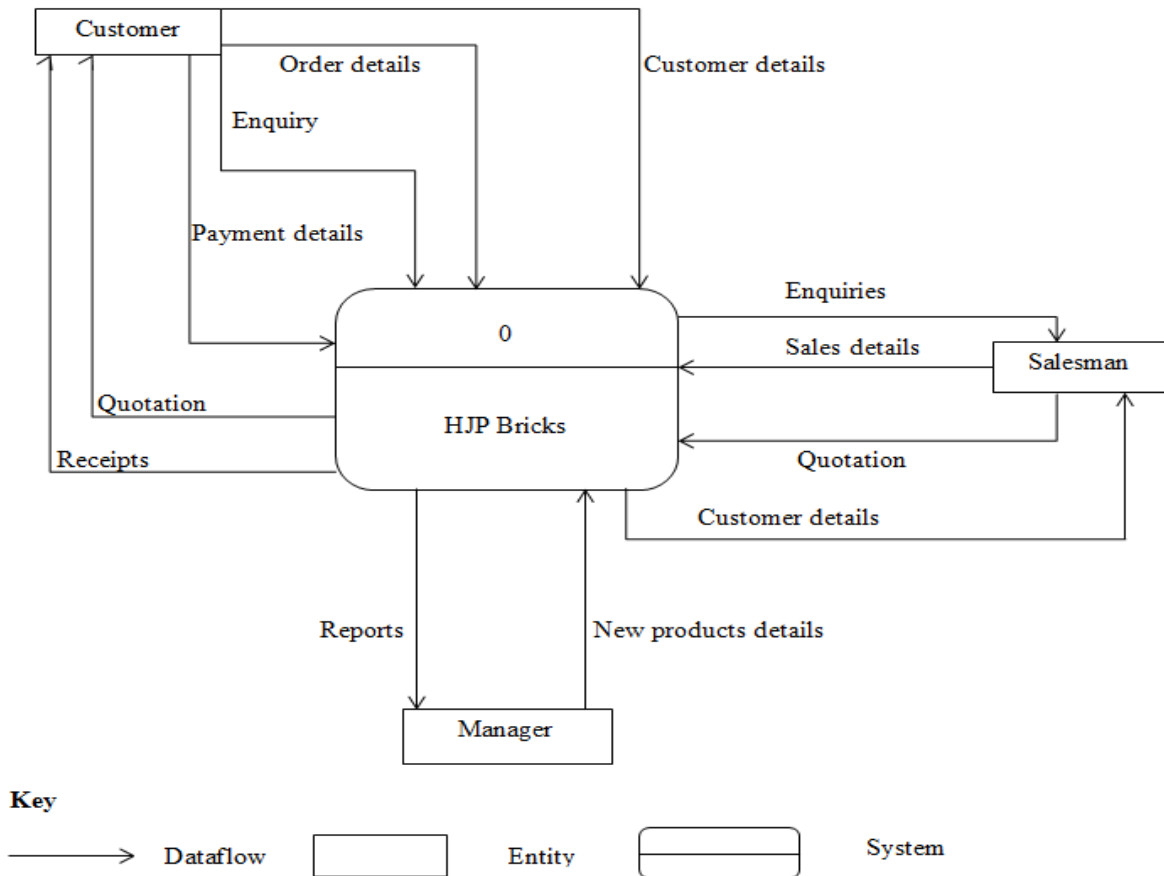

Fig 4.1 Context diagram of the proposed system

4.2.3 Data flow diagram of the proposed system

A dataflow diagram (DFD) is a diagrammatical representation of data channels, related processes, data sources and data sinks (Alexander, 2011). Data channels marks the source and destination of data with directions being shown, data sources are usually entities who provide an organisation with data and the data sinks marks the final destination of data usually files. The data flow diagram of HJP suppliers is illustrated in fig 4.2.
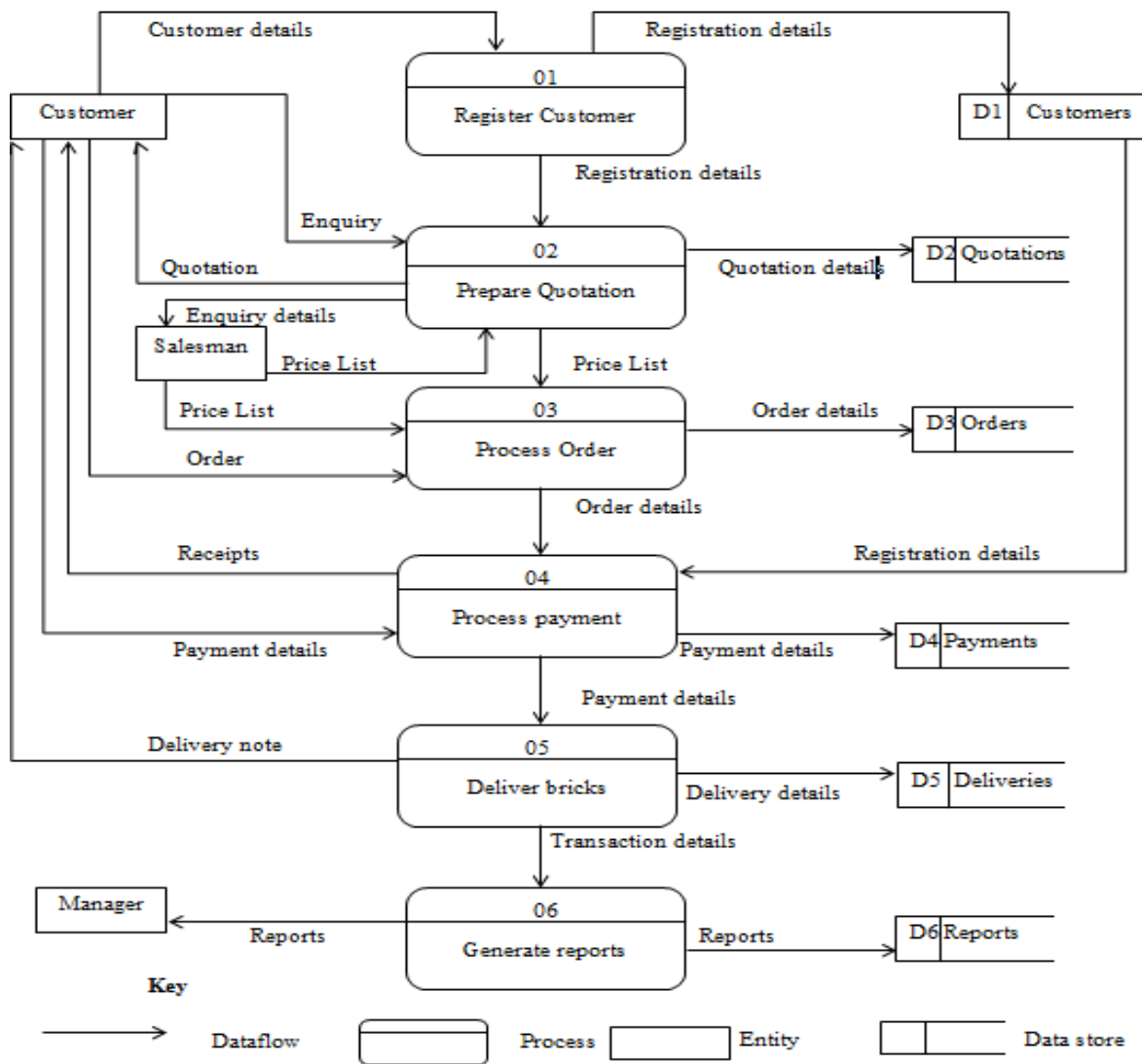
Fig 4.2 Dataflow diagram of the proposed system

4.3 ACHITECTURAL DESIGN

Architectural design is the most initial design where subsystems are identified and the establishment of a framework of subsystem control and communication. The very first step is to determine whether the system is a client server or stand-alone application. Server-based computing refers to a technology in which applications are implemented and managed on the server rather than the client as defined by Hennessy and Patterson (2006). Upgrading of system hardware, application deployments, data backups and technical support are carried out in a server-based environment.

On the other hand there is stand-alone system. This is a system which deploys local services, use them and then terminate when they are no longer needed. Stand-alone applications need

no remote service. Table 4.1 shows the comparison of a server based application and a stand-alone application.

Table 4.1 comparison of Client server versus Stand-alone architecture

	Client Server Application	Stand-alone application
Cost	Very high	Low
Control and security	Very high	High
Ease of development	High	Low
Room for future development	Very high	High

From the above comparison, the preferred architecture is a client-server based architecture. Fig 4.3 shows the preferred network architecture.
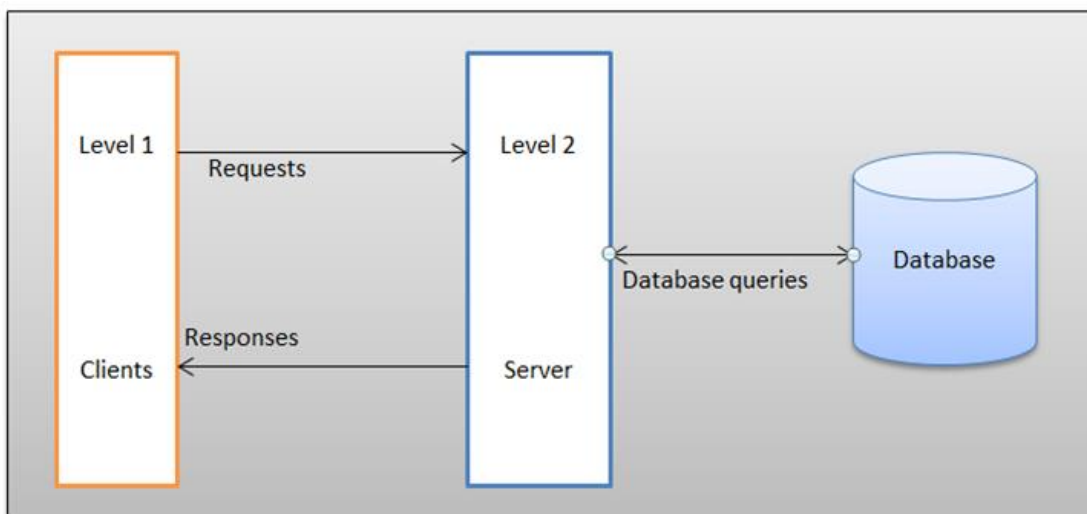
Fig 4.3 System architecture

Source: Ricardo (2011).

4.4.2 Client machines

Client machines are types of machines that are connected to other machines which are the servers to use their services and different resources. These are also called requesting machine which can serve data and run some applications provided by the server. These requesting

machines varies from desktops, laptops and palmtops in which the users are supplied with interfaces of the client such as windows, unix, linux and they are connected over a network to the server (Connolly and Begg, 2005). .

4.3.3 Server

A server is a computer program that provides services to other programs within the same computer or in other computers through a network. A machine containing that program can also be called a server. It that provides certain services to requesting machines which are its clients connected over a network. The server machines can sometimes be dedicated or can also be used for various purposes. All the HJP Bricks transactional data and website relate data will be stored in the server.

4.4 PHYSICAL DESIGN

Hennessy and Patterson (2006) define physical design as the determination of the technical setup of the computer environment and how hardware and software operates. The physical location of hardware and the way in which the devices are connected is also outlined. The setup will include wired and wireless network. Some computer will be connected on a switch. A wireless router is also needed so that other devices will be wirelessly connected.
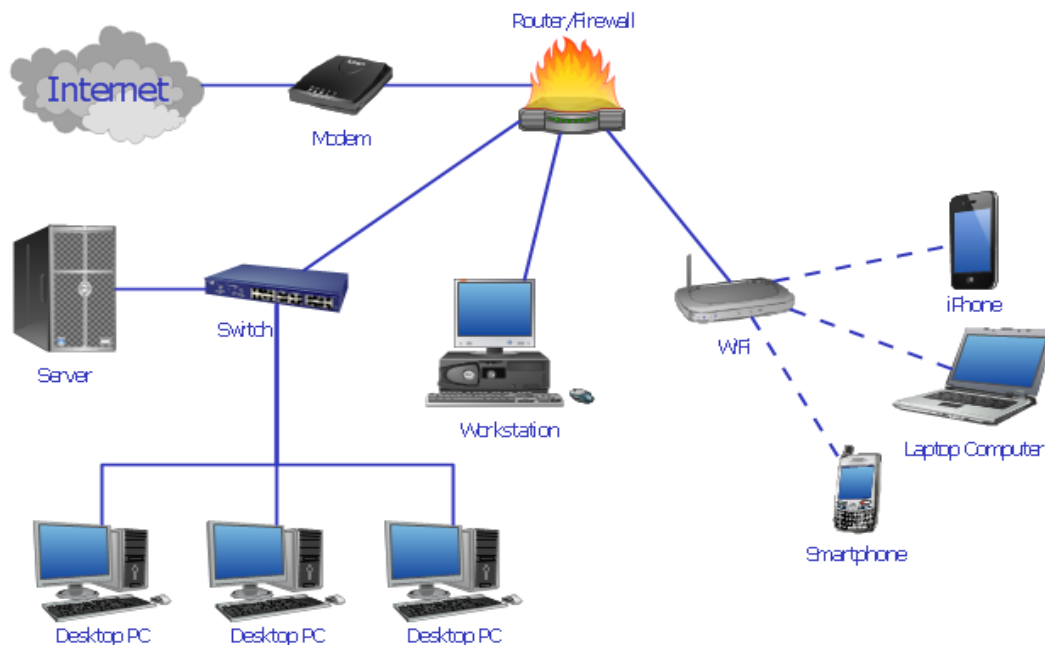

Fig 4.4 The Physical setup of the system

Source: Hennessy and Patterson (2006)

4.5 DATABASE DESIGN

Dietrich and Urban (2011) defines the term database as a collection of organised data that easy to access and manage. Database design is the logical designing of data structures that are used to store data. In an electronic database, data is organised into rows and columns. The database schemas in the tables that contain the data can be represented using class diagrams and enhanced entity relationship diagrams (EER). The database view levels are illustrated in fig 4.5.
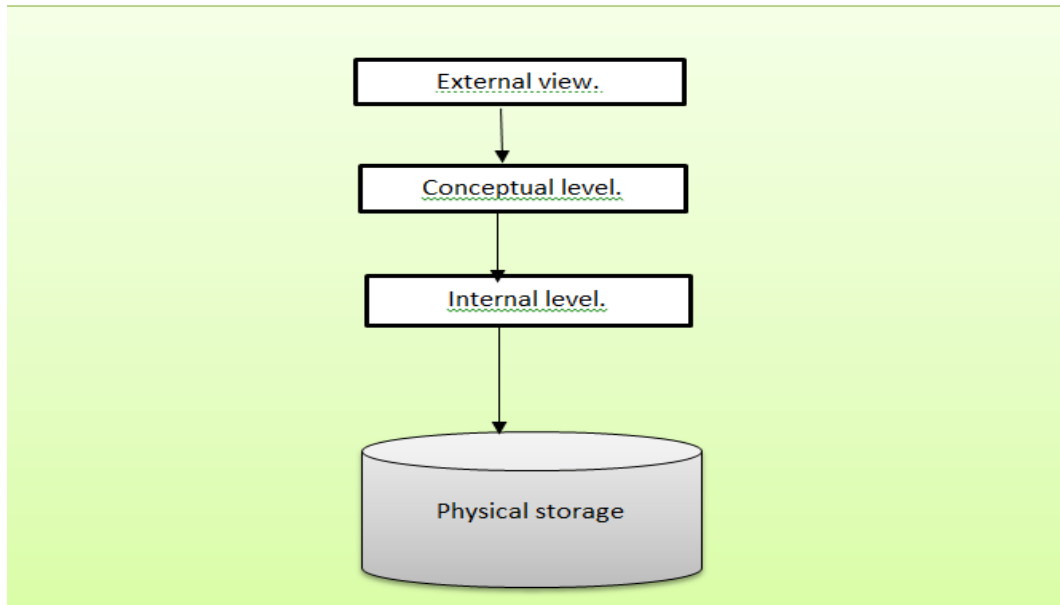
Fig 4.5 Three level architecture

Source: Ricardo (2011)

4.5.1a External level

The external level can also be termed the user view level which shows the highest level of abstraction. The main function of this level is to allow user interaction with the database and simplify user views (Ricardo, 2011). This is usually achieved through user forms, tables and graphs for reports. The structured query language is used to echo database data and provide it to the users.

4.5.1b Conceptual level

This level shows the actual database data and the relationships among the stored data (Ricardo, 2011). The table attributes and data-types describe the type of data that can be stored in each cell. Queries are also defined and their relationships outlined in this level.

4.5.1c Internal level

The internal level shows the lowest level of abstraction and it shows how database data is actually stored (Connolly and Begg, 2005). This level shows the data definition, Meta data and access path for the database. This is also known as the physical level of the database. It deals with data compression and encryption methods if they are used in database queries. Complex low level data structures are dealt with in this level determining the data that must be kept in the database.

4.5.2 Database Tables

Table 4.2 Customer Details

Field name	Data type	Description
Name	Varchar(25)	Actual name of the user
Surname	Varchar(25)	Surname of the user
Email address	Varchar(30)	Unique identifier
Customer id	Auto increment (pk)	Primary key
Password	Varchar(30)	Key to personal profile

Table 4.3 User Cart

Field name	Data type	Description
Cart id	Auto increment (pk)	Primary key
Customer id	Int not null	Foreign key
Order details	Varchar (50)	Description of the order
Payment status	Default : pending	Payment status
Date ordered	Current time stamp	Recorded automatically
Price	Currency	Price of each product
Total cost	Currency	Value of the cart

Table 4.4 Products table

Field name	Data type	Description
Product name	Varchar (20)	Name of the product
Product id	Auto increment	Primary key
Category	Varchar(20)	Product category
Price	Currency	Price of the product
Amount	Int not null	The stock level

Table 4.5 Admin table

Field name	Data type	Description
Id	Auto increment	Primary key
Name	Varchar (20)	Real name of the admin
Surname	Varchar(20)	Actual surname of the admin
Username	Varchar (20)	Unique
Password	Varchar (20)	Private credential

Table 4.6 Payments

field name	Data type	Description
Customer id	Int not nul	Foreign key
Cart id	Int not null	Foreign key
Total payment	Currency	Total amount paid
Balance	Currency	The amount due
Date paid	Current time stamp	Time of transaction

4.5.3 The enhanced entity relationship diagram

An enhanced entity relationship diagram is a diagrammatical representation of entities with attributes and relations (Dietrich, 2011). It is the extension of the original entity relationship diagram. They depict what is stored in the database of an organisation. An entity is an object class which are in form of tables in the database. Enhanced entity relationship diagrams shows how the entities are going to interact on the proposed system.
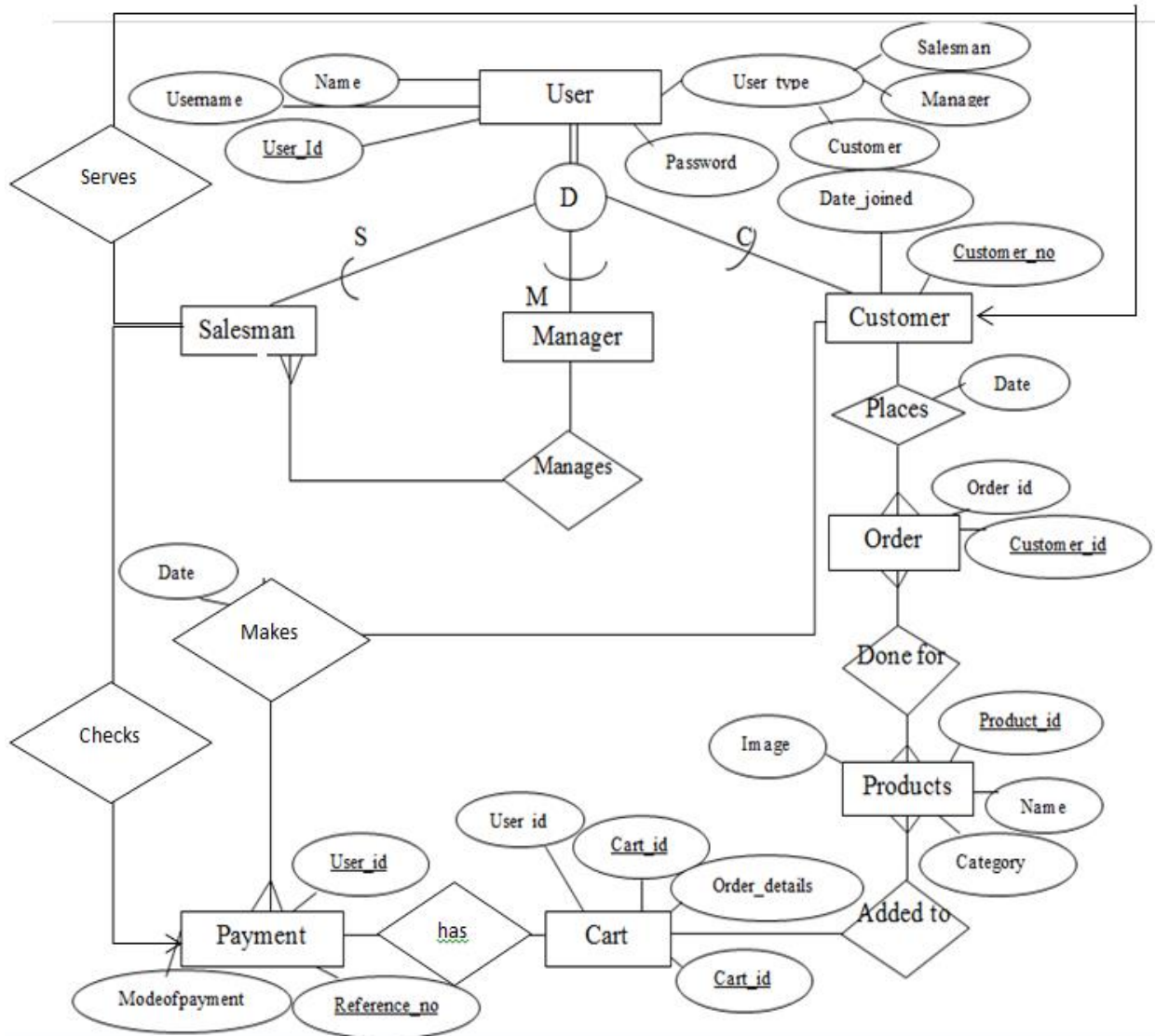
Fig 4.6 Enhanced Entity Relationship Diagram of the system

4.6 PROGRAM DESIGN

Program design describes how the system will actually work and it models the processes involved (Ralph and Wand, 2009). The process interrelationships and process sequence are also outlined at this stage. Package, class and sequence diagrams are used at this stage to show how the system will work.

4.6.1 Package diagram

A package diagram can be described as a diagrammatical representation of the module relationships and their role in achieving system objectives. It shows the importance and relationships of components of the HJP Bricks online ordering system. Below is a package diagram which shows module inter-dependants of the HJP Bricks online ordering system showing how they will interact with all the users.
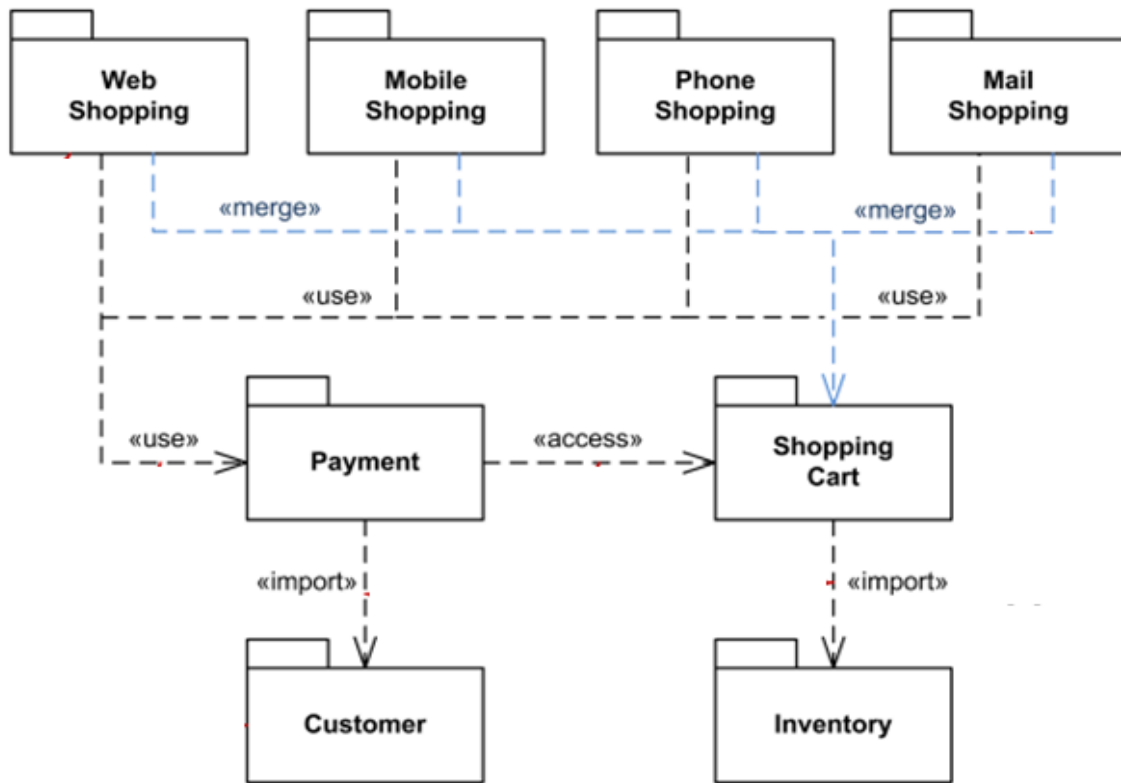
Fig 4.7 Package diagram of the system (Ralph and Wand, 2009)

4.6.2 Class Diagram

A class diagram is a type of static structural diagram that designates a system structure showing its classes and their attributes as well as operations and the relationships between the objects (Scott, 2009). The class diagram can be viewed as the main building block of object-oriented modelling. A class diagram is used for both general conceptual modelling of the application, and for detailed modelling that translates the model into a programming code. They can also be used for data modelling. The objects in a class diagram represent main elements interactions in the application and the classes that need to be programmed.

In system designing a number of classes are identified and clustered together in a class diagram so as to help determine the relationships between them. With comprehensive modelling, the classes of a conceptual design are usually split into a number of subclasses.
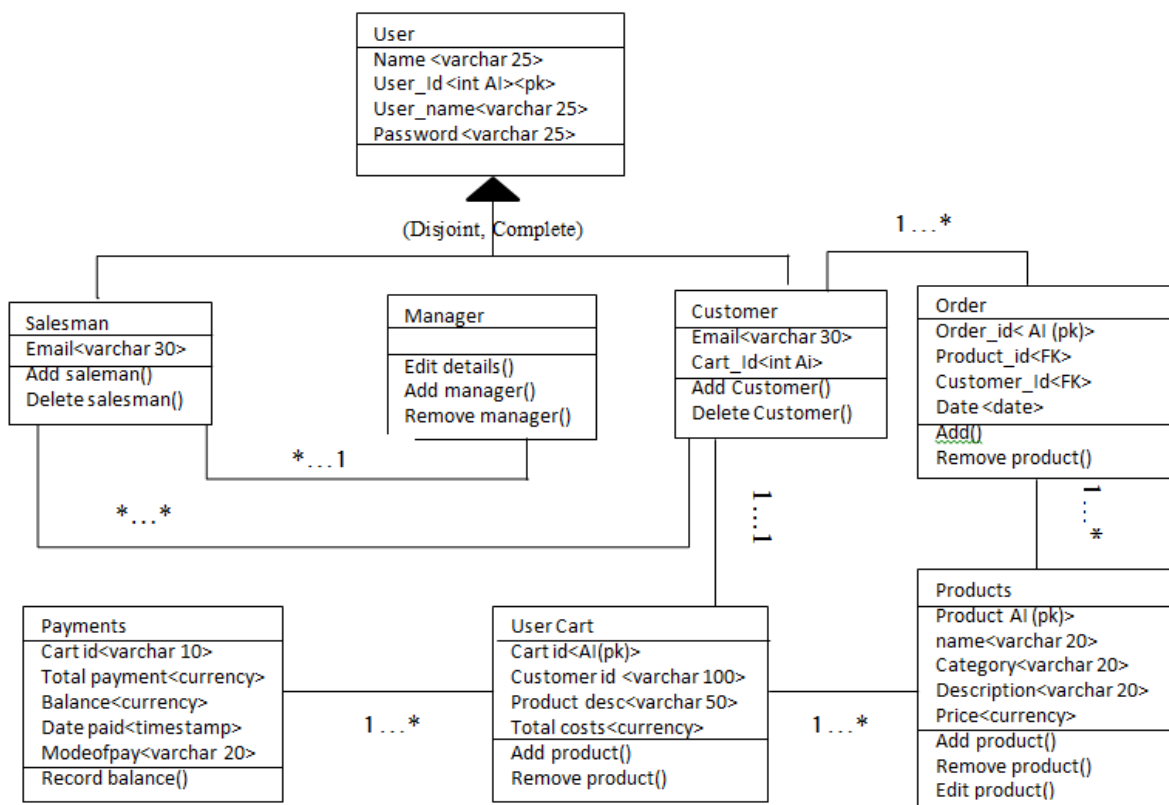
Fig 4.8 UML class diagram

4.6.3 Sequence diagram

Brently (2004) defines a sequence diagram as an interaction diagram which shows how system objects operate with one another whilst specifying their order. It shows objects interaction arranged in time sequence. A sequence depicts the objects and classes that are involved in the scenario and the communication sequence between the objects needed in carrying out the functionality on different scenarios. They are typically associated with use case realisations in the logical view of the being developed system. Sequence diagrams can be sometimes named event diagrams.

Sequence diagrams display, as parallel vertical lines (lifelines), different processes and or objects that live simultaneously and some horizontal arrows representing the messages exchanged between them preserving the order in which they occur. This simplifies the specification of runtime scenarios in a understandable graphical manner. The sequence diagram of the HJP Bricks online ordering system is as follows.
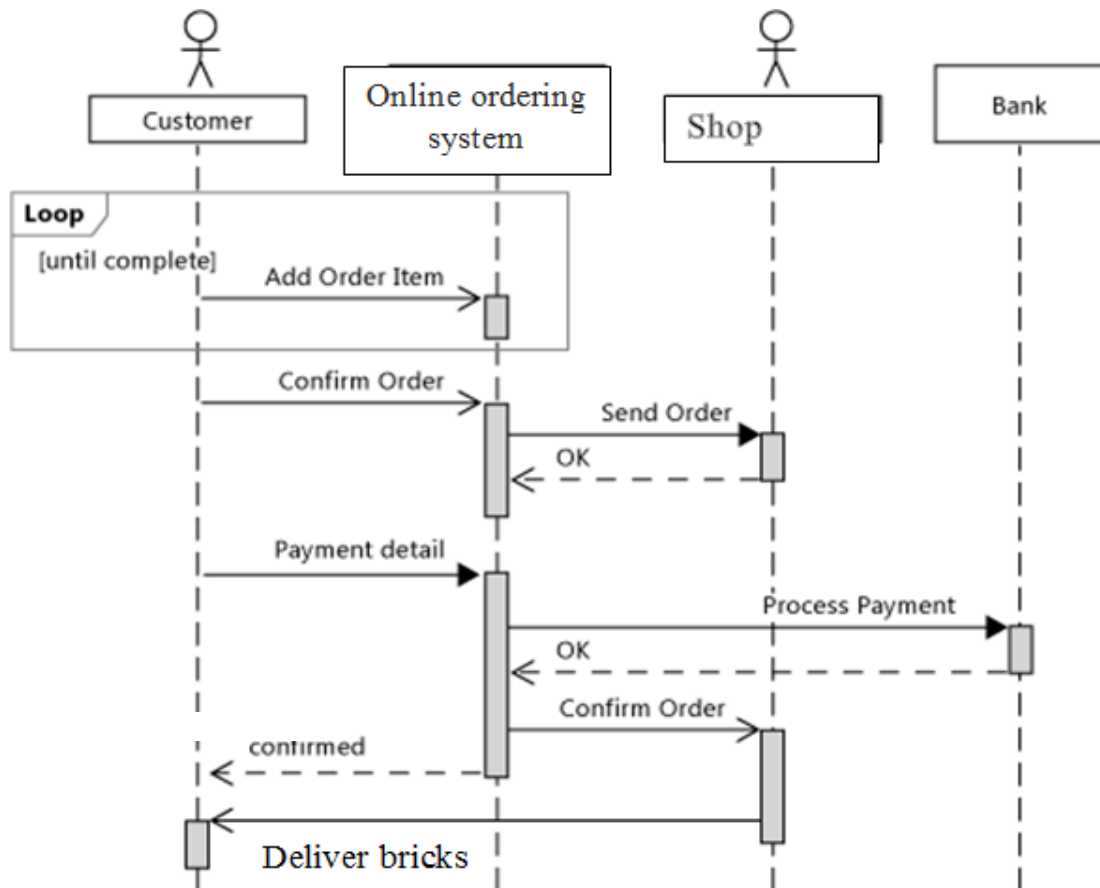
Fig 4.9 sequence diagram

4.7 INTERFACE DESIGN

An interface can be defined as the go between external entities with the system (Brently, 2004). Interfaces allow the interaction of users and the database and other system contents. Well-designed interfaces have ease of navigation and usually allow two way communications. Interface design is the process of determining and simulating the structure of the system interfaces which are suitable for the system so as to meet its objectives.

The HJP bricks online ordering system's interface design shows the nature of input that is accepted and the output structure. Interface design will clearly show the relationships between different interfaces and the stages which can be followed to do a certain transaction. Interface design should be:

- Easy to learn without need of technical expertise
- Communicative with understandable language
- Allow reversal actions such as back, cancel and reset
- Fast in responding.

4.7.1 Menu design

A menu can be described as a list of options that are presented to the user of a computer system (Written et al., 2004). It may be a system's entire user interface, or partial of a more complex system. Users choose options from a menu through the use of an input device. Some of the input methods need linear navigation, the user moves a cursor or just pass from one menu item to another until getting the selection.

4.7.1.1 Main menu
Fig 4.10 shows the main menu which interact with users in the first position.
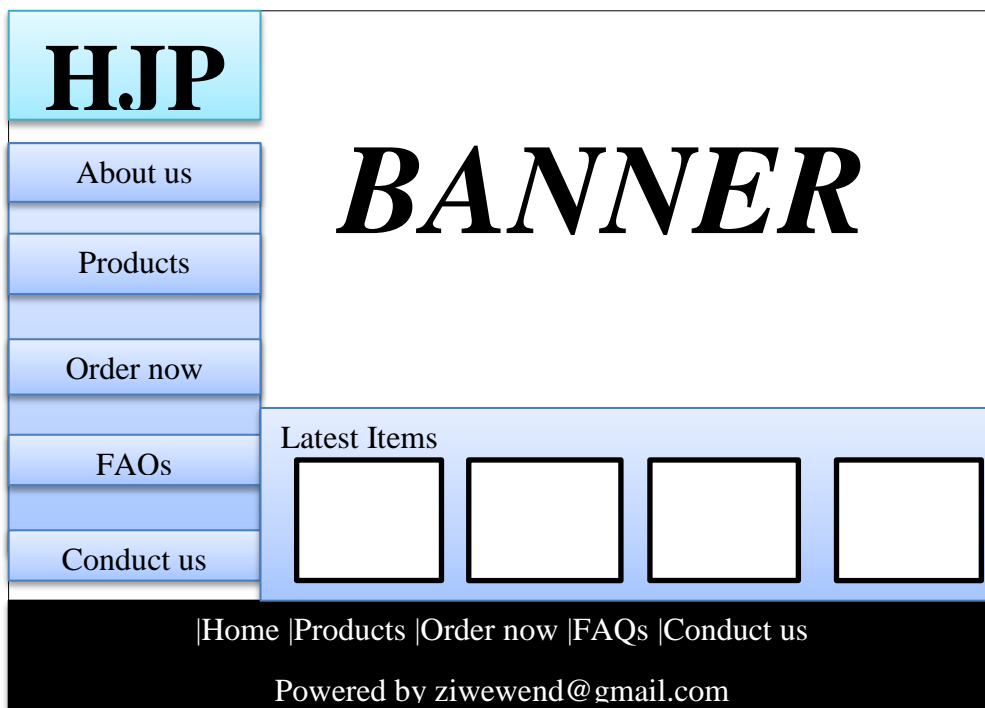
Fig 4.10 Main menu of the system

4.7.1.2 Sub menus
When users click "products" they will see the list of bricks that are currently available in stock. This is shown in fig 4.11.
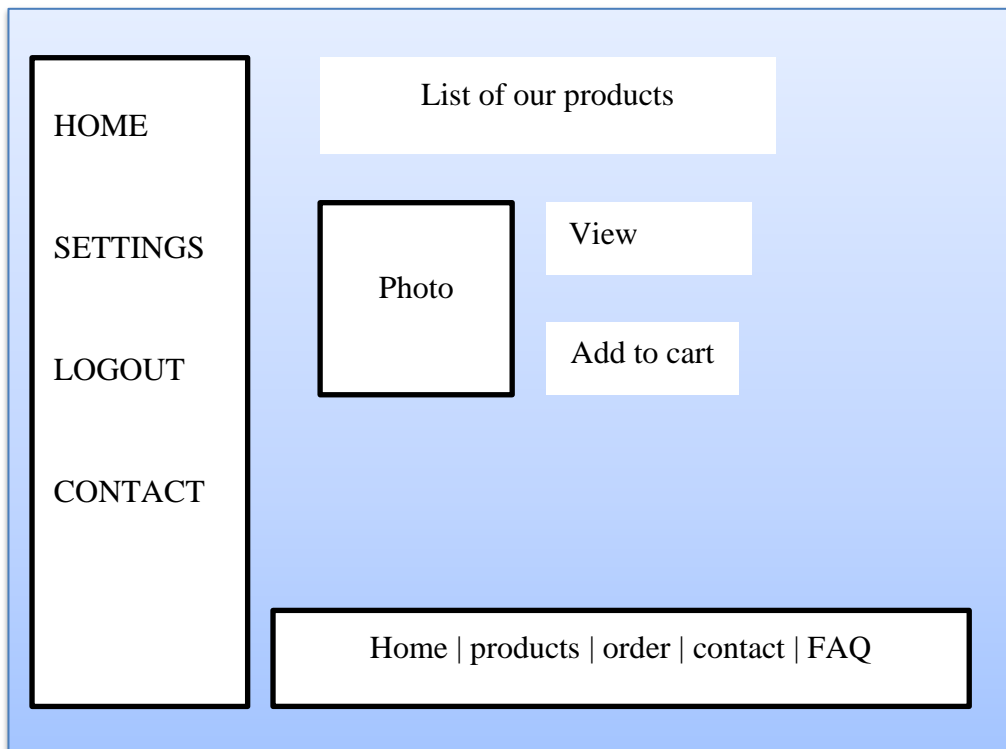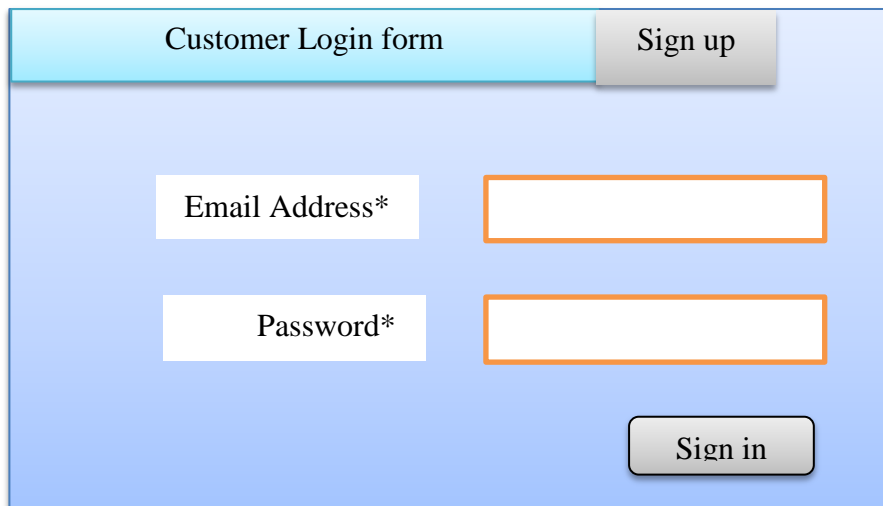
Fig 4.11 Sub menu 1

4.7.2 Input design

When users need to update database data, they insert input into the system through input forms (Written et al, 2010). These input forms need to be carefully designed so that data validation will be done correctly. Invalid input must be detected and not accepted and the user must be alerted. System users create their accounts and use some credentials in login, the data that is entered must be checked for validity. The input entered will determine the access level of the user so the interface must be linked properly. Below are some HJP Bricks online ordering system input form.

Fig 4.12 Customer Login form.

This input form accepts input that already exists in the database. Only registered customers are allowed to proceed after login. Users can be alerted in case of an error.

Fig 4.13 Customer registration form

Customers sign up using the form above imputing their details so that they are stored into the database. Password is designed in a way that it hides the characters for security reasons. Re-enter password is just there for confirming the user password selected.

Fig 4.14 Input form for adding products in the database.

When admin login into his account he/she can add products for sale through the above input form. Name and category fields are designed with drop down menus so that the admin can select from the list. This is done to ensure only products which are provided by the company are selected to reduce room for typing errors. The choose file field allow the uploading of the image of the product.

4.7.3 Output design

When the system inputs are received they are processed so as to produce outputs. The output will be available to the users in form of reports and tables. The structure of the tables will be as follows.

Product Table								
10	Records per page						search	
Name	**Description**	**Category**	**Origin**	**Price**	**Quality**	**image**	**Action**	
							Edit	Delete
Showing number of entries							previous	next

Fig 4.15 Output table for products

4.8 PSEUDO CODE

Pseudo ode can be described as an English simplified language. Developers use pseudo code to represent what it takes to communicate with the compiler. This code is then converted into compiler understandable code. Pseudo code is intended for human reading not machine reading (Furman, 2010). It omits the essential details that allow machine reading. Pseudo code just outlines the basic principles for the algorithm. The pseudo code for different modules of the HJP Bricks online ordering system is as follows.

4.8.1 Customer registration

Check if user is registered, if not then redirect to "sign up"

If user didn't enter all required data then alert user

If password one and password two are different then alert user there is a password mismatch

Insert user data into the database if required fields are filled with valid data

Else

Give an error message

4.8.2 Login

Select user in the database

If user is found then go to user account

Else

Give alert message

4.8.3 Order

Check if the user is logged in

If user is logged in then add selected products to user cart

Update cart including new products

Calculate new value of the cart

Else

Give an error message

4.8.4 Add product

Prompt user to fill product details

If input fields are empty, alert user

Insert product details into database

Calculate the number of products added in database

Alert the user that the product was successfully added

Else

 Give Error in adding product

4.9 SECURITY DESIGN

Write and Jim (2009) defines a computer security as the protection of a computer system to prevent data loss, physical hardware damage and unauthorised access to information. Security designing includes determining the security need of a computer system and implement possible solution. Security design can be physical or network level.

4.9.1 Physical security

Physical security guide computer systems from unauthorised access, direct sunlight, water and physical damage (Write and Jim, 2009). These can be achieved by employment of physical guards and physical locks. A good computer setup includes dedicated desks where a CPU is set into its drawer.

4.9.2 Network security

Network security deals with the implementation of policies that govern the use of a network (James, 2012). The policies guide against unauthorised access, excess use, denial of service and modification of network resources. Every network user must be trained and must be aware of the policies being implemented. When using the internet, the browsing sessions must be secured and emails to be filtered. The network basically needs a unique name and password and the password must be alpha-numeric and at least eight characters so that it will become difficult to trace. Network clients need to be monitored closely and if any mysterious action is detected, counter measures must be took as soon as possible.

4.9.3 Operational security

Operational security deals with making sure that system operations are not interrupted or to guide against any adverse effects (James, 2012). Users must feel secured when using the system. The use of unique credentials is the first and foremost security mechanism in use. Users feel that their accounts are safe and no one can alter them. The database security key is only known to the database administrator who will make sure nothing is modified directly unless there is need to do so. System validation also work as a safety mechanism since all user input will be valid. No user actions will interfere with the actions of another even where there is concurrent database modification. Some of the operational security key points are listed below.

- The system will assure that in order table, order_details table and product table, the salesman will not make modification to price, quantity and id to reduce the chances of fraud by changing prices and total costs to some customers.
- Salesman users will have access to their own data and cannot edit members' data.
- The system will allow audit trail which will allows the manager to monitor and review the salesman data modification in case of fraud.

4.10 CONCLUSION

The designing phase well outlined how the new system will operate in the work environment. Different levels of designing were outlined such as database, architectural, physical and product design which shows the skeleton of the system as a whole. Relationships between various entities were outlined in this chapter as well as the dataflow and processes involved. The security mechanism were outlined which will help to preserve data integrity and correctness. The design specifications are then achieved through the use of programming codes. When the code is developed it is followed by implementation. The system will be introduced to the working environment. The next chapter focuses on implementation of the new system. Implementation comprises of testing, installation, conversion, changeover and user training.

CHAPTER FIVE: IMPLEMENTATION PHASE

5.1 INTRODUCTION

This chapter concentrates on implementation of the system under development. System implementation consists of various levels of testing, training, installation and file conversion. Areas which need corrections can be identified as quick as possible through testing so that they are corrected. The system will start to work once the developer is satisfied.

5.2 CODING

Coding can be defined as the writing a programming language using the programming platform so that the compiler will understand (Hartmann, 2009). This is done in developing systems, applications and software. The code is the language which builds and controls the behaviour of a programme. The HJP Bricks online ordering system was build using the Php and Html. See appendix for some of the code used.

5.3 TESTING

System testing include any activity that is done with the aim of detecting any errors and capability of a system (Ehmar, 2010). Various types and levels of system are conducted so that the effectiveness and efficiency of a system in meeting requirements specification is determined. System testing is an on-going process from coding to installation and maintenance. There are two types of testing namely black-box and white-box testing as mentioned below.

5.3.1 Black-box testing

According to Ehmar (2010), black-box testing can be defined as a software testing method that examines an application's functionality without looking into its internal organizations or code workings. This testing method can be applied almost in every level of system testing that is unit testing, integration testing, system testing and acceptance testing. Black-box testing consists of high level testing and suit every stage of testing.

Black-box testing does not require specific knowledge of the internal code structure and knowledge about the programming language used. The system testers are worried by input output relationship not how the output is being processed. Test cases are developed around system specifications and user requirements. These test cases are usually derived from the external software descriptions which include specifications, user requirements and design

parameters. The test designer selects both valid and invalid input parameters to determine the input-output relationship. Black-box testing is illustrated in fig 5.1.

Fig 5.1 Black box
Source: Ehmar(2010)

5.3.2 White box testing

This is a method of system testing that tests the interior structures of a system application. This can also be referred as to clear box or glass box testing (Ehmar, 2010). This type of testing requires more knowledge in the programming language used that is the tester must possess enough knowledge in the programming language. White-box testing can be applied at different stages of testing namely unit, integration and at system level. White box testing can be used to test faults within a module or unit, faults lying between different units during integration, and faults between subsystems during the system level test. It can uncover some errors and help to clean code since unused code can be detected. Fig 5.2 illustrates white box testing.
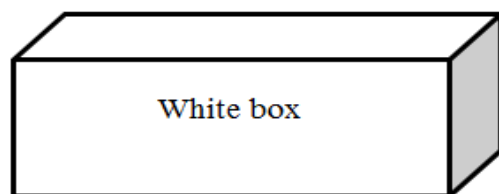
Fig 5.2 White box testing
Source: Ehmar (2010)

5.3.3 Levels of testing

There are several levels of system testing which describes the modularity of the test. Fig 5.3 shows the different levels of testing.
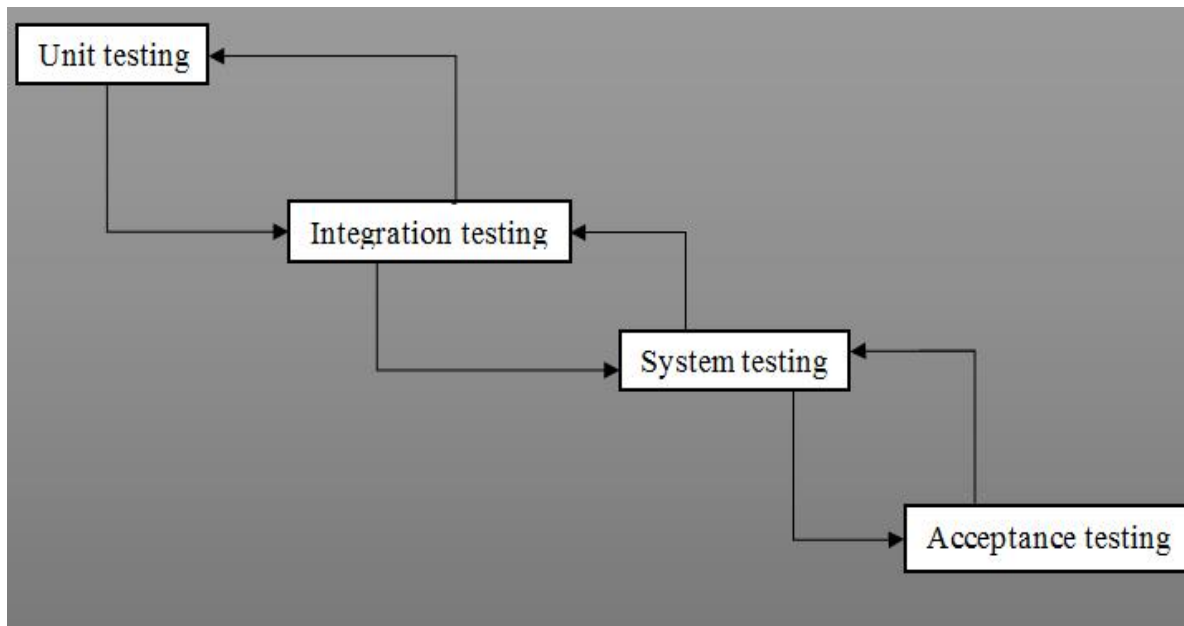
Fig 5.3 Levels of testing

Source: Kolawa (2009).

5.3.3.1 Unit testing

Unit testing is when individual units of code are examined in order to determine if they are fit for purpose (Kolawa, 2009). Unit test can be viewed as the smallest testable slice of a system application that can form the basis for component testing. Unit tests are usually done on small sections of code during coding and can also be done by white box testers when the system is partially functional. Each test case is set independently from others. They are usually run by programmers so as to ensure that their code meets intended design and behaviour.

5.3.3.2 Integration testing

According to Kaner (2003), integration testing is a process where individual modules are put together and tested as a group. The main aim is to detect faults that result in integration.

5.3.3.3 System Testing

Kanner (2003) defines system testing as an activity of examining the functionality and compliance of an integrated system as a whole. The main aim is to determine whether the system meets the specified requirements.

5.3.3.4 Acceptance testing

This is a level of software testing that is used to determine whether the system is acceptable for delivery (Rodriguez, 2014). Testers test the system so as to determine its compliance with business requirements. Users are also involved in this level of testing. This was done in two ways that is beta and alpha testing.

- **Alpha testing**

Alpha testing can be described as a simulated system testing which is done by the potential users or a specialist independent testing team at the development site (Dustin, 2002). This is often used as a form of internal system-acceptance testing since it works with the potential users.

- **Beta testing**

According to Dustin (2002), beta testing is a software testing technique which is usually after alpha testing that can be taken as a way of external user acceptance testing. Developers release beta versions to a limited targeted audience who are outside the coding team named beta testers. The software under construction is exposed to groups of different people for further testing who will help to reduce bugs. These Beta versions can be provided to the general public.

5.3.4 Validation

Validation testing is a process by which developers examine the system under development whether it meets the business requirements specification (Black, 2008). It gives the answer to the question, "are we building the right product?" Validation ensures that the product meets the client's needs.

Fig 5.4 shows a warning message which appears when the user leave empty fields on the registration form which reads please fill this field. The form will not be submitted if the field is filled.
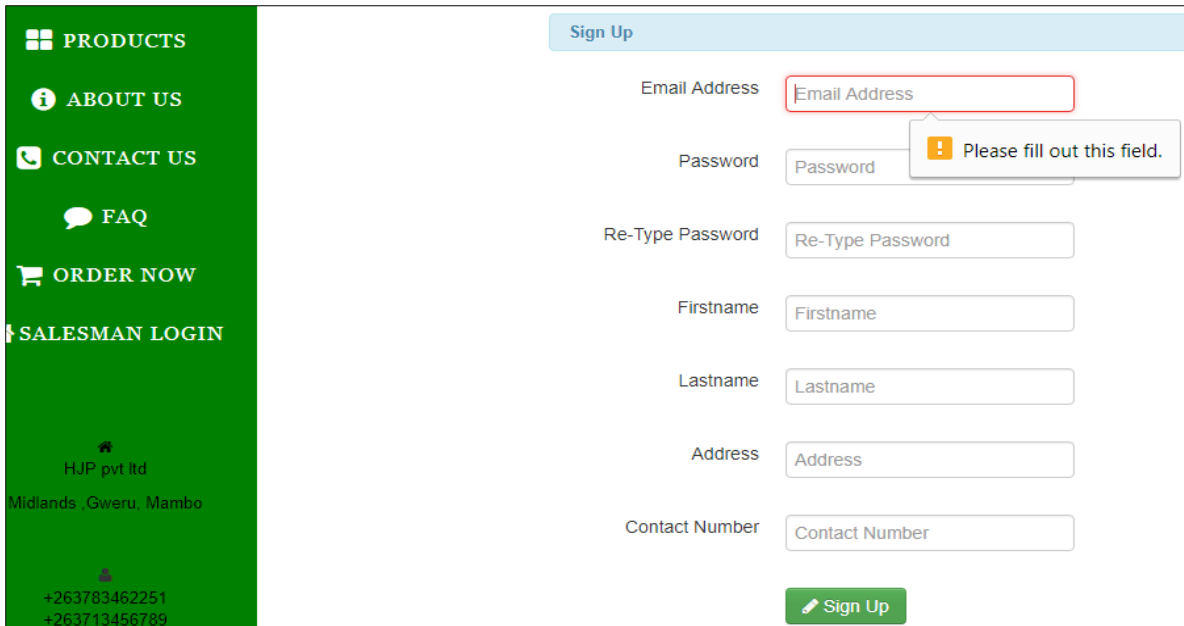
Fig 5.4 Omission validation screen shot.

Fig 5.5 is an input type validation screenshot which shows a warning message when a user enters non email input. This is done to ensure corectiness of user details.
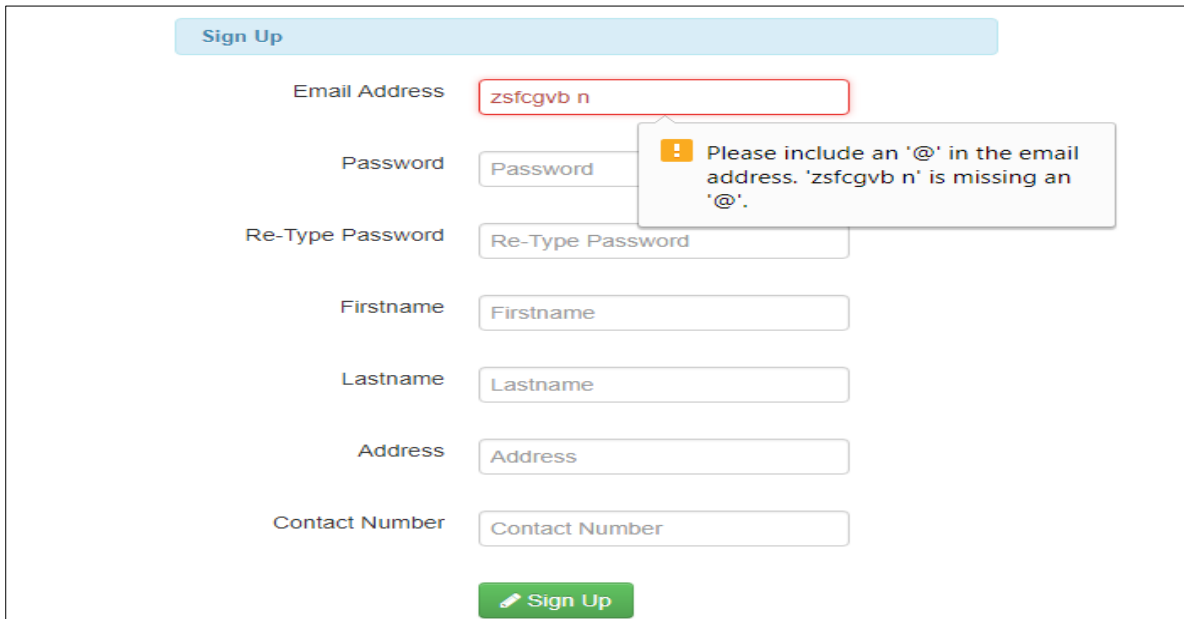
Fig 5.5 Input type validation screenshot

When the user enters a week password, the system will alert him/ her that the password is too short it must contain at least eight characters. The form can't be submitted if the password is not lengthened. This is shown in fig 5.6.
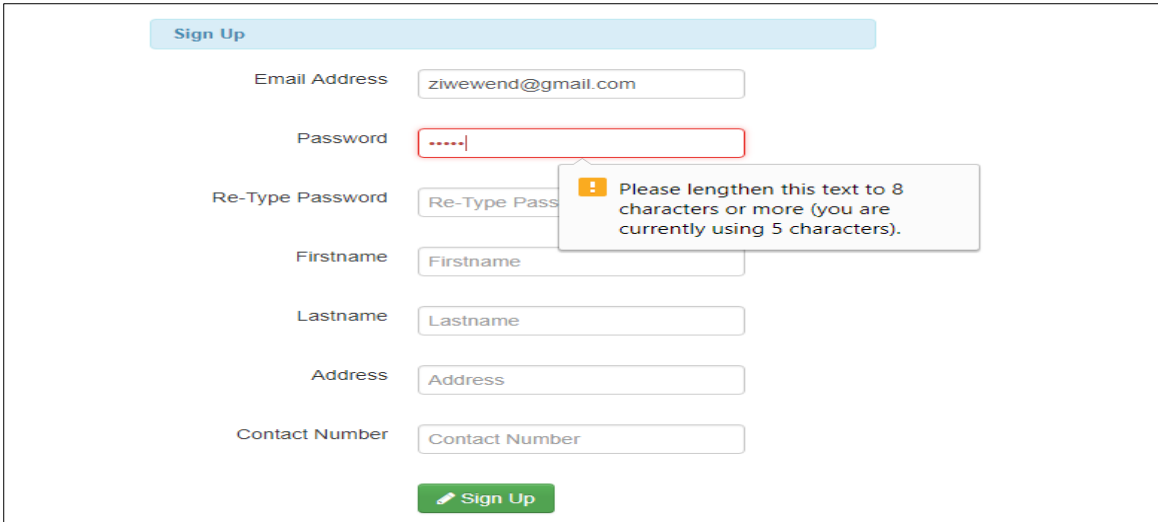
Fig 5.6 Password strength validation screenshot

More so the system have a security mechanism by which it checks the confirmed password to determine if the user is aware of what he enters as a password. The system will compare the passwords entered and is case sensitive.
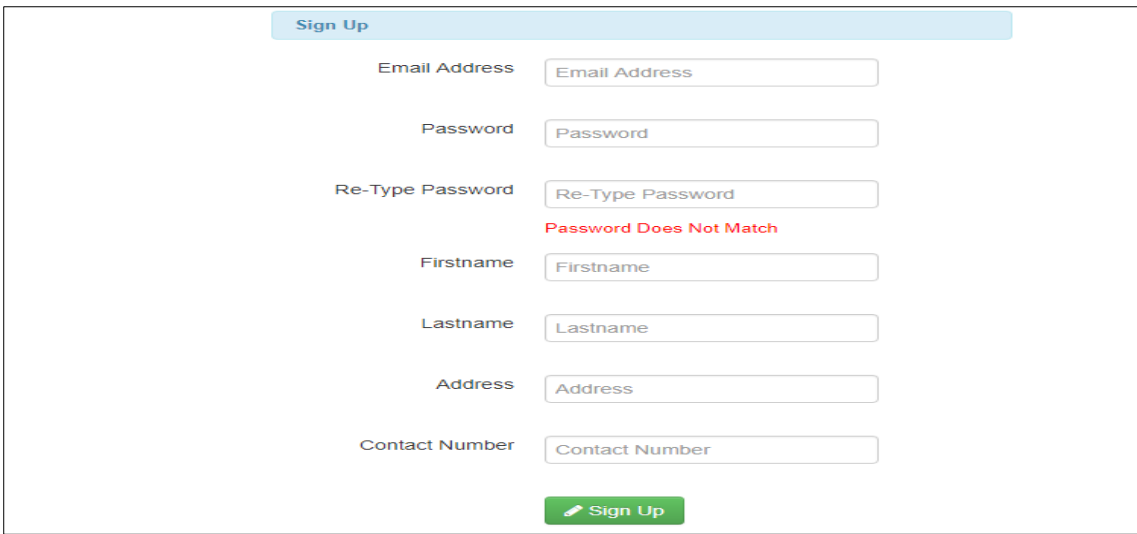
Fig 5.7 Password match validation screenshot

Furthermore data-type validation was done to ensure allowable data-types are the only to be submitted into the database. Fields including name and surname must contain only alphabetical characters and a hyphen (') character. Fields like contact number only allow numeric values and a plus sign (+). The error message which will appear is shown in fig 5.8 when a user enters non numeric values on the conduct number input field.

Fig 5.8 Data-type validation screenshot

On the security issue, the system requires intact credentials so that the user can access his/ her account. Incorrect details will be detected and the system will not specify the exact field with no a database match. Fig 5.9 shows the error message which will appear when user enters incorrect credentials.

Fig 5.9 Login security screenshot

When making order, the system ensures that no numbers below one are entered and the maximum number of items in the database is the maximum that can be ordered. Fig 5.10 shows the system forbidding the user to enter a number greater than two which is the number of bricks in the database.
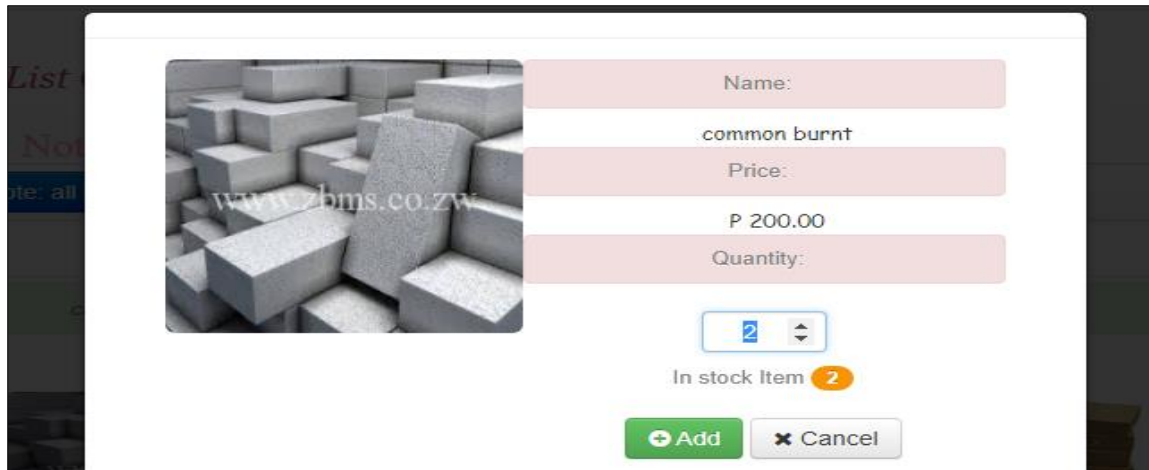
Fig 5.10 Maximum order validation check

5.3.5 Verification

According to Black (2008), system verification can be described as a set of steps that are taken to check the correctness of the system. Verification is a continuous process which was done in every development stage to check whether the activity outcomes are in line with the requirements specification. A sample of data was used to test if the system performs as needed.

5.3.5.1 Advanced search

The system was tested to determine if it allows dynamic search in database elements. The user can specify the records with match to the search items. The specifications include less than, greater than, equal to, not equal to, between, not between, empty and not empty. If between is chosen, another search box will appear which marks the maximum value. Search items can be printed separately and can be exported to excel files, CSV and word documents.

Fig 5.11 Advanced search page screenshot

Concerning search, the verification results were all satisfactory.
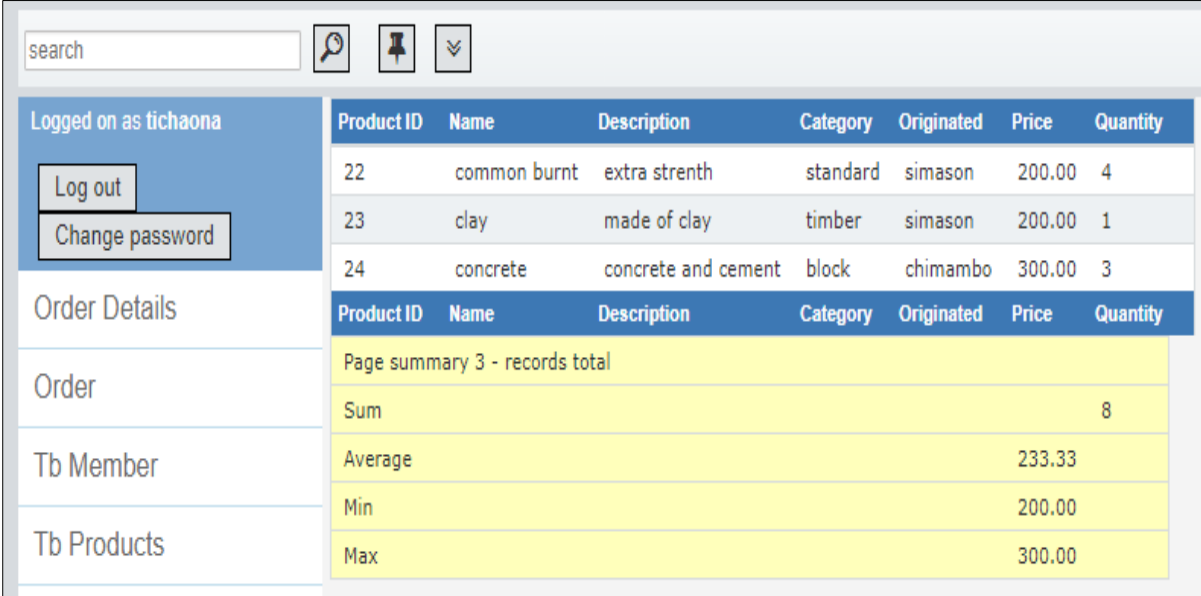
5.3.5.2 Exporting data

Database data can be exported to other formats such as Microsoft word documents, excel sheets and Comma separated values (CSVs) as shown in fig 5.12. The system will allow users to specify if they want to export the current page or all records in that table. Exporting can also be done to only selected fields by checking associated checkboxes.

Fig 5.12 Export data page

5.3.5.3 Reporting

The system produces reports from the database which allow easy identification of data elements. Sum, average, minimum and maximum values can be calculated automatically. The manager can also search for a certain type of products, price or date and the summaries will be automatically calculated. The summary include average, maximum, minimum and sum.

Fig 5.13 Product report

5.3.5.4 Notification

The system haves a dashboard in which when the manager log into the system he or she will be notified on stock level, and transactions report in form of charts. The manager will be notified concerning the number of products left in stock. Colour zones in charts shows the minimum and maximum desirable levels. The charts can also respond to searches and selection for example the manager can search for a certain type of transaction and the chart will present only the needed data. Fig 5.14 shows how the charts will be presented.
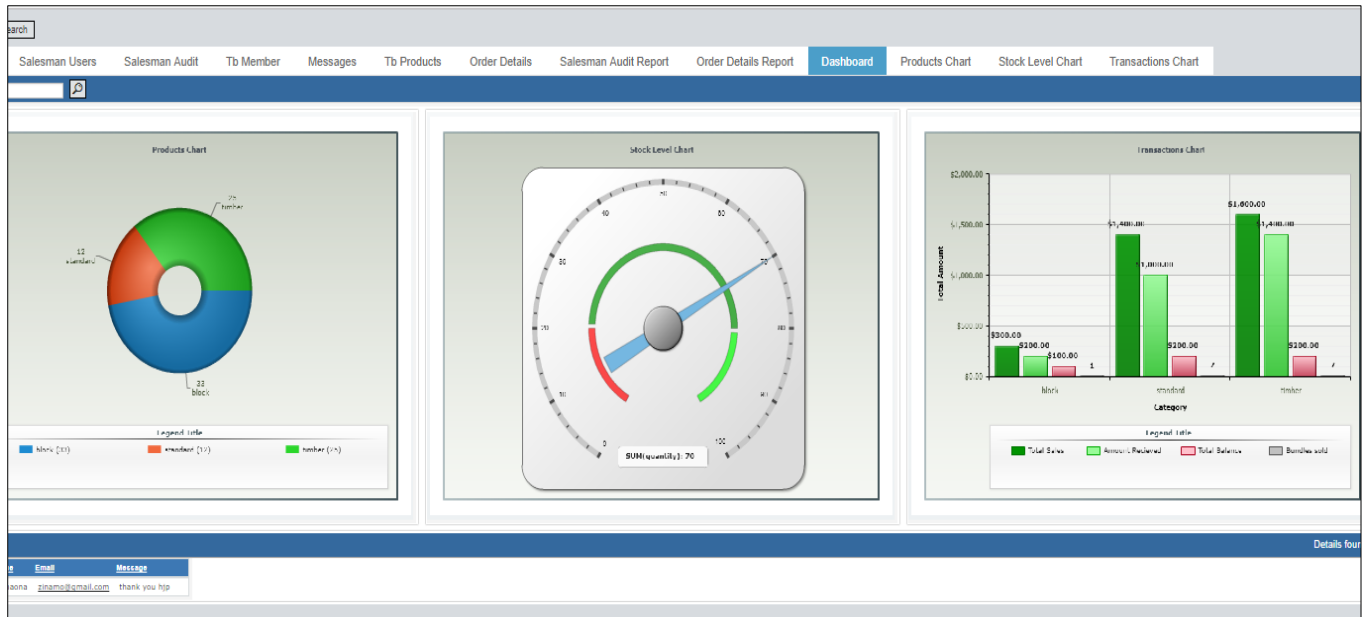
Fig 5.14 Dashboard screenshot

5.3.5.5 Security enforcement

The system allows users to edit their details only which shows the account management security level. They can not edit their id which is the primary key.

Fig 5.15 User account management

The Salesmen can not edit products price, product id and product name to avoid case of overcharging and fraud. They can edit on description and origin of the bricks.

Fig 5.16 Security enforcement screenshot

5.3.5.6 Database querying

The system allows the manager to add, delete and edit products in the database with its properties excerpt the product id. Fig 5.17, fig 18 and fig 5.19 shows adding, deleting and editing bricks respectively.

Fig 5.17 Adding products to the database
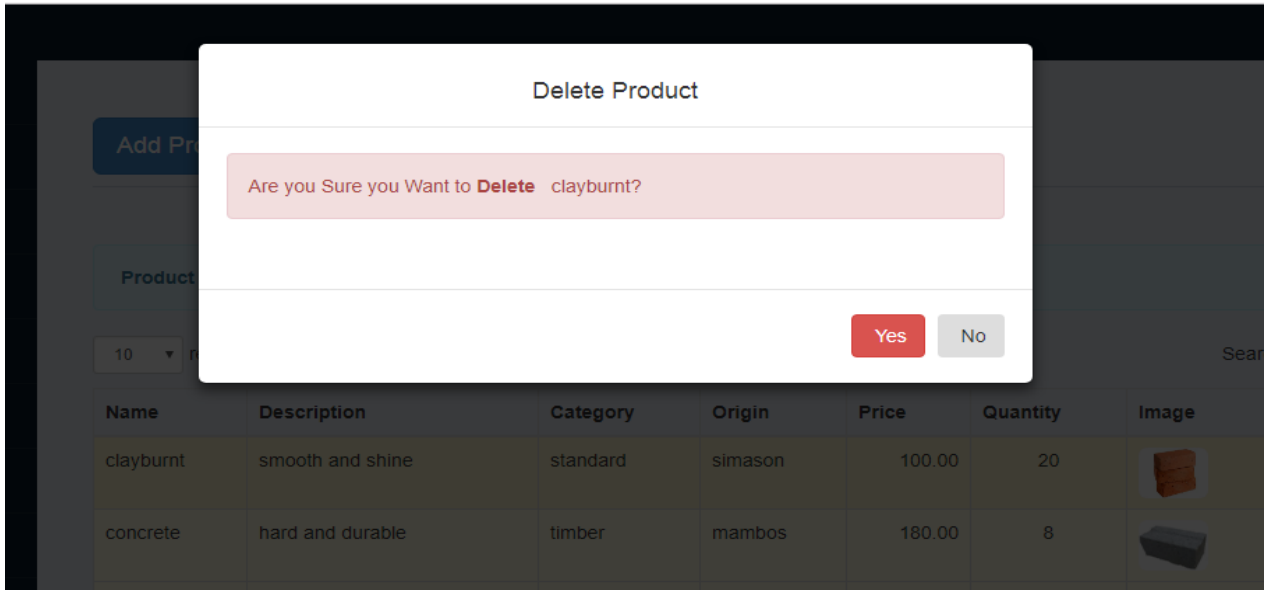
Fig 5.18 Deleting database data
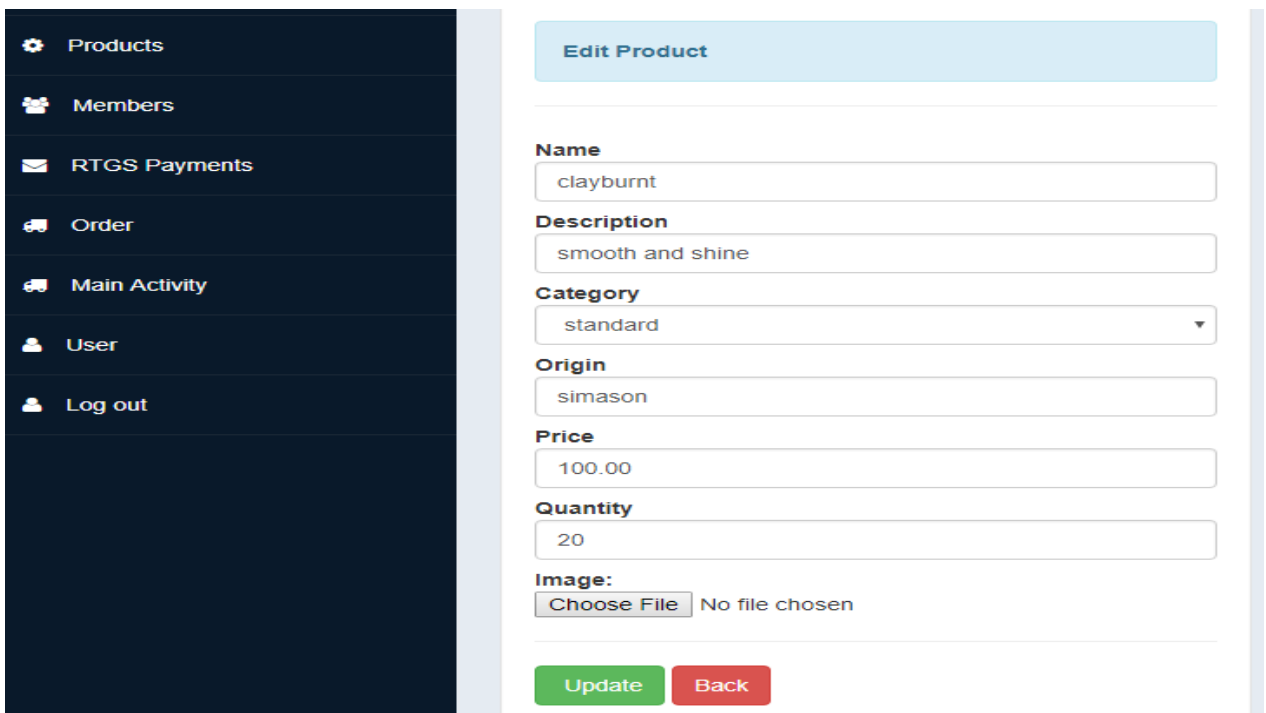
Fig 5.19 Editing products from the database

5.3.5.7 Audit trail

The manager can view database activities done by salesmen. The activities include login, adding, editing, deleting. If the activity results in data modification, the system will record the old value and the new value for assessment by the manager. The Internet Protocol (IP) address of the user will also be recorded.

Id	Datetime	Ip	User	Table	Action	Description
66	2017/09/24	::1	tichaona	salesman_users	login	
67	2017/09/24	::1	tichaona	order_details	edit	---Keys orderid : 24
68	2017/09/24	::1	tichaona	order_details	edit	---Keys orderid : 23 ---Fields status [old]: Pending status [new]: delivered More ...
69	2017/09/26	127.0.0.1	tichaona	salesman_users	login	
70	2017/09/26	127.0.0.1	tichaona	salesman_users	login	
71	2017/09/26	127.0.0.1	tichaona	salesman_users	login	
72	2017/09/26	::1	tichaona	salesman_users	login	
73	2017/09/26	::1	tichaona	salesman_users	login	
74	2017/09/28	::1	tichaona	salesman_users	login	
75	2017/09/28	::1	tichaona	salesman_users	logout	
76	2017/10/09	127.0.0.1	tichaona	salesman_users	login	
77	2017/10/09	127.0.0.1	tichaona	order_details	edit	---Keys orderid : 43 ---Fields date [old]: 0000-00-00 00:00:00 date [new]: 2 More ...
78	2017/10/14	127.0.0.1	tichaona	salesman_users	login	
Id	Datetime	Ip	User	Table	Action	Description

Page summary 13 - records total

Sidebar menu items:
- Tb User
- Salesman Users
- Salesman Audit
- Messages
- Order Details
- Salesman Audit Report
- Order Details Report
- Dashboard
- Transactions Chart
- Order Contribution
- stock holding Chart

Fig 5.20 Audit trail screenshot

From the above information concerning verification, one can conclude that the system meets the requirements specification. The system was thoroughly verified and the results were satisfactory. It was determined that the system is ready for installation.

5.4 INSTALLATION

System installation is an act of making a computer program ready for execution on the business according to Gagne (2012). After all other stages in the development process which makes the product functional are successfully completed, the system will be introduced to the actual operating environment. Installation generally involves code being copied from the installation files into new files on the local computer or server for easier access by the underlying operating system. The installation process involves user training, file conversion and changeover.

5.4.1 User training

User training is a process of equipping potential users of the system with adequate knowledge to use the developed system (Faria, 2001). The time consumed by the training process depends on the technology literacy level of the trainees. Training can be seen as an on-going process since the system functionality is subject to modification. The initial training process need to be done using workshops for easier and better understanding. The physical training is complimented by a detailed user manual (see appendix). The user manual is there to allow

free space in learning to use the system since it contains a series of steps and instruction is using the system.

5.4.2 File conversion

According to Laudon and Laudon (2010), file conversion is the process of migrating data and processes from one platform to another. File conversion depends on the results of the testing process. Since the system testing produced satisfactory results, the system is ready to receive the data sources.

5.4.3 System Changeover

According to Ferguson and Hebels (2003), system changeover is the process of substituting an old system for a new one. There are various changeover strategies which are direct, pilot, phased and parallel run. Each strategy will be appropriate in its favourite conditions.

5.4.3.1 Direct changeover

Direct changeover is a changeover strategy in which a new system will start to work after the abandoning of the old system (Ferguson and Hebels, 2003). There will be a clear demarcation line on the operating periods between the systems. This is illustrated in fig 5.21a.

OLD SYSTEM   NEW SYSTEM

Time

Fig 5.21(a) direct changeover

Source: Ferguson and Hebels (2003)

Direct changeover has some strengths and weaknesses as follows.

5.4.3.1.1 Strengths of direct changeover

- Direct changeover is resource conservative.
- It is the only solution if there is total failure of the old system

5.4.3.1.2 Weaknesses of direct changeover

- Direct changeover is the most risky strategy especially when working with critical data. The consequences of new system failure are very high.
- The strategy is limited in comparing the outputs of the two systems given the same inputs whilst some problems will escape the testing process before implementation.

- If not communicated properly, the system will lead to workforce demotivation.
- The strategy requires more careful planning and training before implementation.

5.4.3.2 Parallel changeover

According to Piper (2013), parallel run is a changeover strategy that entails the running of the new and the old system concurrently for a specified period of time to determine the capabilities of the new system. The old system will cease to work once the client is satisfied by the new system. Fig 5.21(b) illustrates parallel changeover.

```
┌──────────────────────────────┐
│          OLD SYSTEM          │
└──────────────────────────────┘
        ┌──────────────────────────────────┐
        │           NEW SYSTEM             │──▶
        └──────────────────────────────────┘
────────────────────────────────────────────▶
```

Time
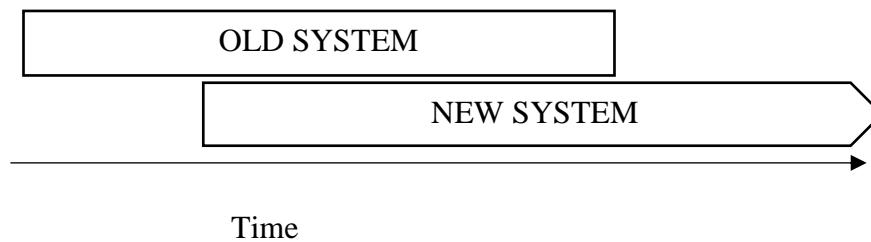
Fig 5.21(b) Parallel changeover

Source: Piper (2013)

Strengths and weaknesses of this changeover strategy are listed below.

5.4.3.2.1 Strengths of parallel changeover

- Parallel run strategy gives room for outcome comparison between two running systems.
- Parallelism reduces the risk of data loss in case of system failure which makes it more appropriate when working with more critical data.
- Parallel run is more user friendly since it allows them to adapt to the demands of the new system whilst using the old system.

5.4.3.2.2 Weaknesses of parallel changeover

- Parallelism require extra effort and resources since there will be duplication of work hence it's more costly.

5.4.3.3 Pilot changeover

Pilot changeover involves the implementation of a system at a pilot level and new pilots depend on the success of the system on a preceding pilot (Cooper, 2005). This is illustrated in fig 5.21(c).

```
┌──────────────────────────────────────────────────────────┐
│  OLD SYSTEM  │        │        │       NEW SYSTEM         │
└──────────────────────────────────────────────────────────┘
              ──────────────────────────────────────────────▶
                            Time
```
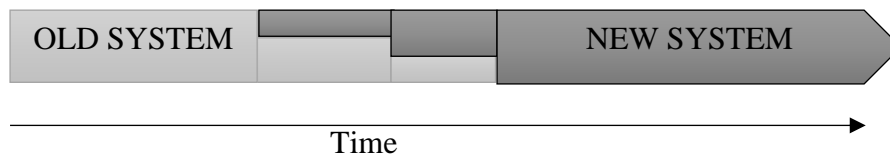
Fig 5.21(c) Pilot changeover

Source: Cooper (2005)

5.4.3.3.1 Strengths of pilot changeover

- Pilot run is cheaper as compared to parallel run.
- Pilot implementation is less risky as compared to direct changeover since failures can be detected at a pilot site before contaminating the whole business.

5.4.3.3.2 Weaknesses of pilot changeover

- Pilot changeover is not appropriate where the old system has already failed.
- Pilot implementation maybe time consuming as compared to direct changeover.
- The problem of biased results may result. A system may work well at a pilot stage but as workload increases it may fail.

5.4.3.4 Phased changeover

In phased changeover the system is introduced in phases whist the old system is still in operation (Piper, 2013). It may be by function until the whole system replaces the old system. Small parts of the system are introduced to the working environment and if they are successful then new parts will be integrated. Phased changeover is shown by an illustration in fig 5.21 (d).
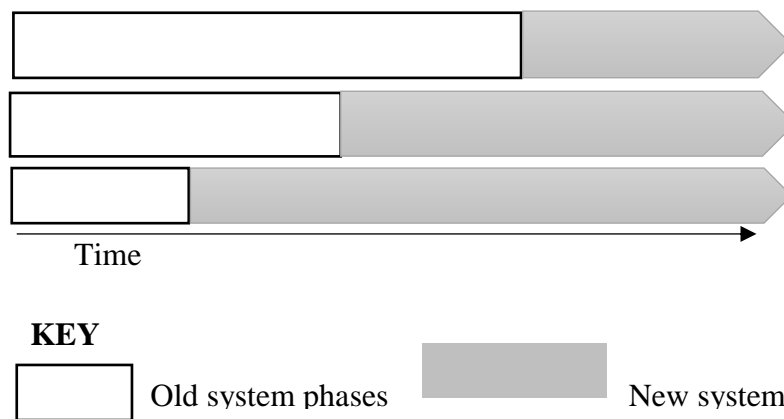
Fig 5.21 (d) Phased changeover

Source: Piper (2013)

Phased changeover has its own strengths and weaknesses as outlined below.

5.4.3.4.1 Strengths of phased changeover
- Phased changeover is less risky since the system will be implemented in phases.
- Phased changeover involves less cost than parallel changeover.

5.4.3.4.2 Weaknesses of phased changeover
- Phased changeover consumes time in implementation which makes it unsuitable n case of urgency.

5.4.4 Selection and justification

As outlined above, the strategies have their own favourite conditions where they can be implemented. The developer considered the suitability of the changeover strategies for selection of the strategy to use in the implementation of the HJP Bricks online ordering system. Parallel changeover became the favourite strategy because of the following reasons:

- The organisational members of HJP Bricks Ltd are using a manual system so they need ample time to adapt and gain trust to the new system so the systems need to be run parallel.
- The system will work with critical data which is costly to recover when lost so there is need for a less risky strategy which is parallel changeover.

5.5 MAINTENANCE

Software maintenance is an art of correcting, modifying and improvement of system components so as to make sure it is in its best condition (Penny and Amstrong, 2003). This is done to meet day to day business requirements. Maintenance can be structured or unstructured. Structured maintenance comes in many forms namely preventive maintenance, corrective maintenance and adaptive maintenance.

5.5.1 Structured maintenance

Structured maintenance can be described as a document led maintenance system where organised and known procedures are followed (Hartmann, 2009). Structured maintenance is basically formed by three different types namely preventive, adaptive and corrective maintenance. Maintenance follow a series of steps as illustrated in fig 5.22.
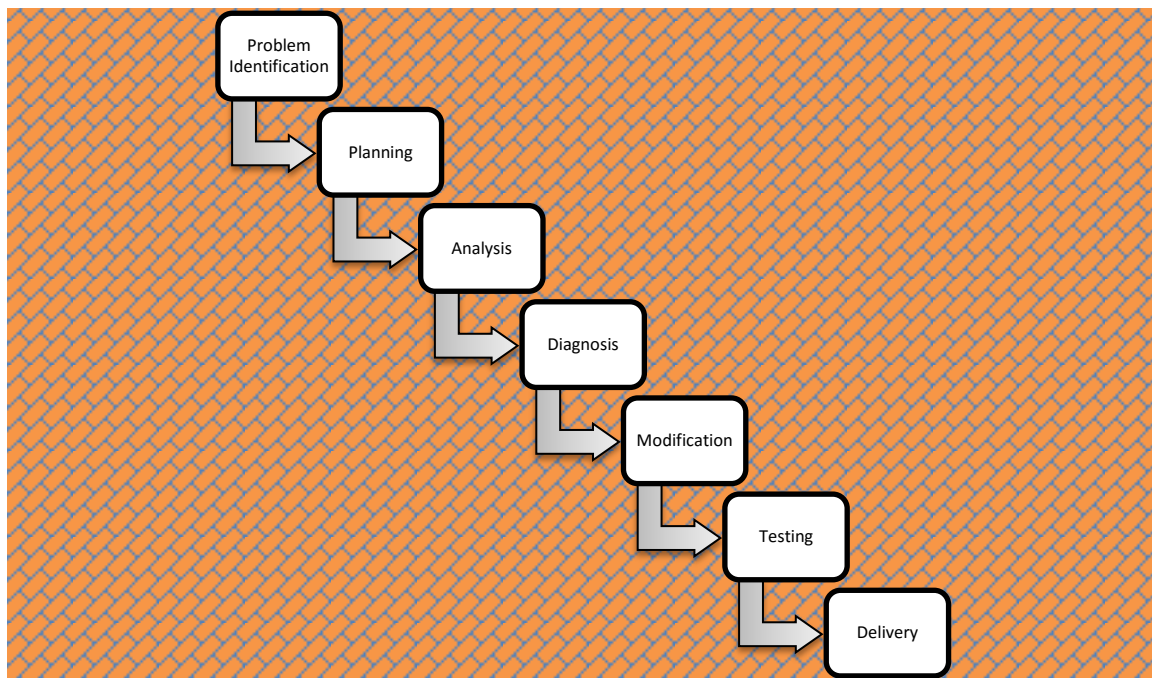
Fig 5.22 Structured Maintenance.

Source: Hartman (2009)

5.5.1.1 Preventive maintenance

According to Penny and Amstrong (2003), preventive maintenance is defined as the art of maintaining a certain level of service for a system. This is done to make sure that any faults are foreseen before they occur and preventive measures are taken. Software bugs are detected prior to occurrence and counter measures are taken. Regular checks on the computer system

both hardware and software need to be carried out so that the system will stay near to perfection.

5.5.1.2 Adaptive maintenance

Business environments are always changing which derive business objectives to change hence systems need to be adjusted to suit new business objectives. Adaptive maintenance is a form of maintenance that is aimed at system modification to meet new business environmental needs (Hartman, 2009).

5.5.1.3 Corrective maintenance

When the system gets problem, corrective maintenance is the applicable approach. Corrective maintenance is a maintenance form which aim to correct already occurred problems.

5.5.2 Unstructured maintenance

Unstructured maintenance is the answer to a problem when the system needs a speedy and dirty modification (Hartman, 2009). A Quick repair may be needed for the organisation to continue with its normal way of doing business. This calls for unstructured maintenance. Unstructured maintenance best suit where there is miner problems or just malicious code modification. The users submit a request for change to the developer who then tests the condition of the system and modify the system. Change may also be as a result of a change in the business strategy. Unstructured maintenance is shown in fig 5.18.

Fig 5.23 Unstructured maintenance

Source: Penny and Amstrong (2003)

5.5.3 User manual

According to Selic (2009), a user manual is a booklet or piece of writing that is produced by system developers for the system users. Users refer to the manual so that they can be able to use the system. It contains a series of instructions that when followed correctly, users can get familiar at a faster pace. For user manual see the appendix. This is issued to supplement oral user training.

5.5.4 System review

In system review, developers are interested in determining whether the new system if fit for purpose. System reviews are done periodically when the system is its operating environment (Penny and Amstrong, 2003). Errors and omissions are the drivers of system review where they are located and fixed. System review is an on on-going process which helps to maintain the system in its best form.

Major reasons of taking system reviews are as follows.

- To determine whether the testing results were not biased.
- To ensure the proper use of the system by different type of users.
- To follow the development route taken by the system to determine if local standards were surely followed.
- To check the maintainability, flexibility and portability of the system.

5.5.5 System backup service

A system backup must be readily available so that any loss of data may be compensated as early as possible. This is needed to keep data safe and maintain its integrity. Problems may arise from hardware or software failures. Common threats come in various forms such as malicious software from hackers which may disturb the smooth-flow or business data. External drives, cloud memory, memory sticks and compact disks can be used to store crucial data. The backing up of data need to be done at regular intervals. Some of the copies need to be kept outside the organisation's premises so that the data may survive physical destruction such as fire.

5.6 RECOMMENDATIONS

According to Laudon and Laudon (2010), if the system is ready for execution, it is advised that the system must be implemented and start help the organisation in managing and processing the transactions. Users are urged to consult the user manual before using the system and if they need clarification, they must consult the Information Technology personnel.

5.6.1 Recommendations to users
- Users must keep their credentials confidential and safe to avoid malicious data modification by hackers.
- Users are recommended to report any unusual behaviour of the system to the Information Technology personnel.

- Users must follow the Information Technology (IT) policy of the organisation.

5.6.2 Recommendations to the Information Technology personnel

- The IT department must make sure they provide users with required explanation and training so that they enjoy the benefits of the system.
- System modification must be well planned and documented so that errors may be tracked more easily.
- They must make sure the system source files are kept safe.

5.6.3 Recommendations to the management

- The management must provide adequate training to new organisational members as part of induction.
- Proper punishments must be awarded to those who try to maliciously use the system

5.6.4 System objectives versus solutions

In generally the HJP Bricks online ordering system is working properly since it manages to do the following.

- To design a system that enable customers to order bricks online - customers can order bricks online- they are notified if bricks are out of stock.
- To develop a system that automatically generates order reports to the manager - Reports with summaries are presented giving maximum, minimum, sum, average values and can be printed or exported to other formats such as excel, word, pdf and CSVs.
- To design a system that allow the director to blacklist untrusted customers – Customer accounts can be deactivated by the manager.
- To develop a system that allow the management to upload information on new products - The manager can see and manage the stock levels by adding, editing and deleting products.
- To create a system that allows stakeholders to send their suggestions and opinions concerning the operations of HJP - The general public can leave a recommendation or complain on the site or ask questions.

- To develop a system that provides ready-made quotations by updating cart before the transaction is done - customers can manage their orders through user cart where they can pay online and can see delivered and pending paid orders.

- To develop a system that allow audit trail to salesman by the manager - Audit trail is provided by the system where the manager can see who modified which item showing the old and new values.

- The system produces a chart that shows the level of stock in premises which has already paid for but just occupying space so that the manager can take action in time.

- The system will assure the availability of service since salesman can just enter details in excel sheets or word documents if the system is temporarily down and this data will need not to be entered manually but just importing it.

5.6.5 Suggested improvements

Given that the HJP Bricks online ordering System is correctly installed and start working, there are some recommendations for further improvement as listed below.

- A wide variety of payment methods need to be added to make work easier for remote customers.

- A mobile version of the system need to be developed so that the site maybe easily accessible even without internet connection.

5.7 CONCLUSION

In conclusion, the system can finally replace the current system following the outlined methods and steps. There is need to conduct training workshops to users and provide them with user manuals. The coding process developed the interfaces and other functional code that is provided in the appendix. The testing effort applied helped in detecting and correcting errors and to prevent some future common errors. Various screen shots provided shows how the system will operate and interact with users providing two way communication. Various changeover strategies were mentioned outlining their strengths and weaknesses and parallel changeover come as the preference. Maintenance strategies were outlined which will help the organisation to keep the system functional in the best way. Training procedures outlined which must be followed so that organisational members become familiar with the system more quickly and the training is supplemented by a user manual. Finally the chapter outlined performance of the system in relationship to objectives.

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APENTIX A: USER MANUAL

User manual is there to provide guidelines to the user on how to use the system in an efficient and effective manner. Users must read and understand the following guidelines before using the system.

General Requirements of the System

The HJP Online ordering system requires every user to undergo training on how to use the system and acquaint with the system before using the system. After training and familiarizing with the system the user has to be added into the system by the administrator to enable him or her to use the system.

A user should have the correct login details, that is, the username and password in order to gain entry into the system. Access level rights determine the levels in the system that can be accessed by a certain user and action to be performed.

The system is built on the following technology:

- PHP MySQL technology with apache webserver
- Dream weaver cs6 2017 and Phprunner and xampp

User interfaces and their interaction

The window below is the home page for the HJP Bricks Online Ordering System.
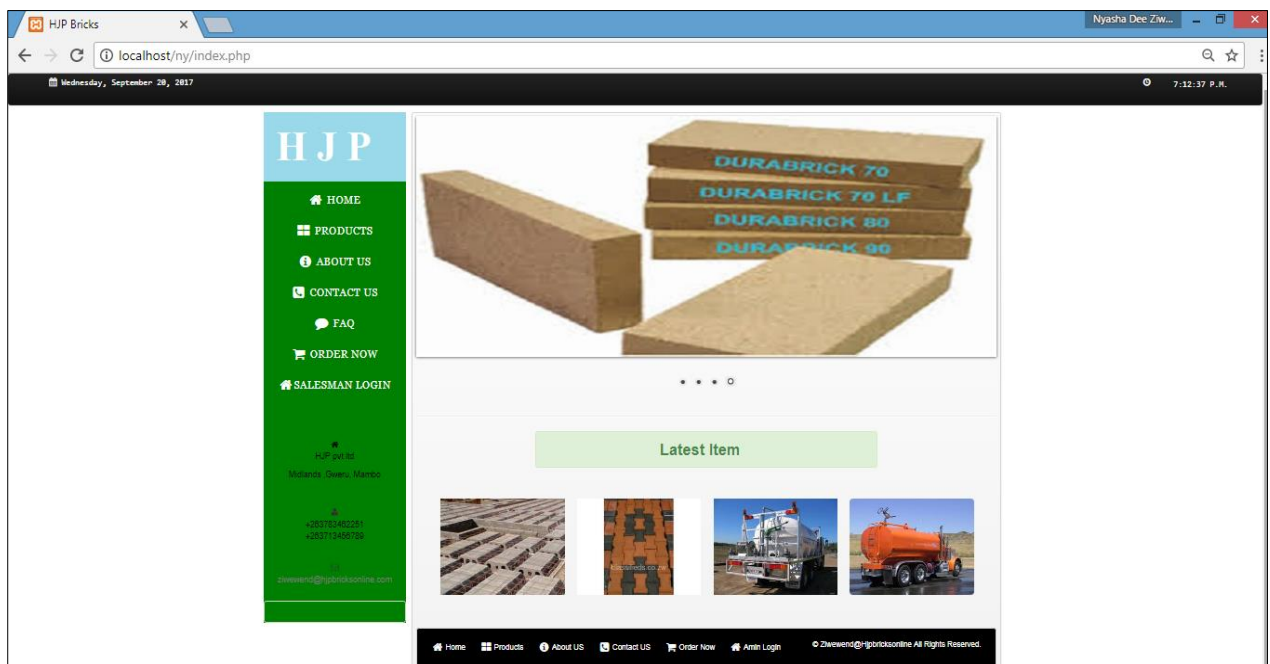
Fig A.1 HJP Home page

User Login

Starting with logging into the system one must have an account and there are customer account, receptionist and admin accounts only who can view secured pages. For the admin to login, there is a link named "admin login" on the bottom right corner. Customers just click where it is written "order now" on the left edge and after clicking they will be directed to a login page where there are two options "login" and "signup". The login pages are shown by the following screen shots.
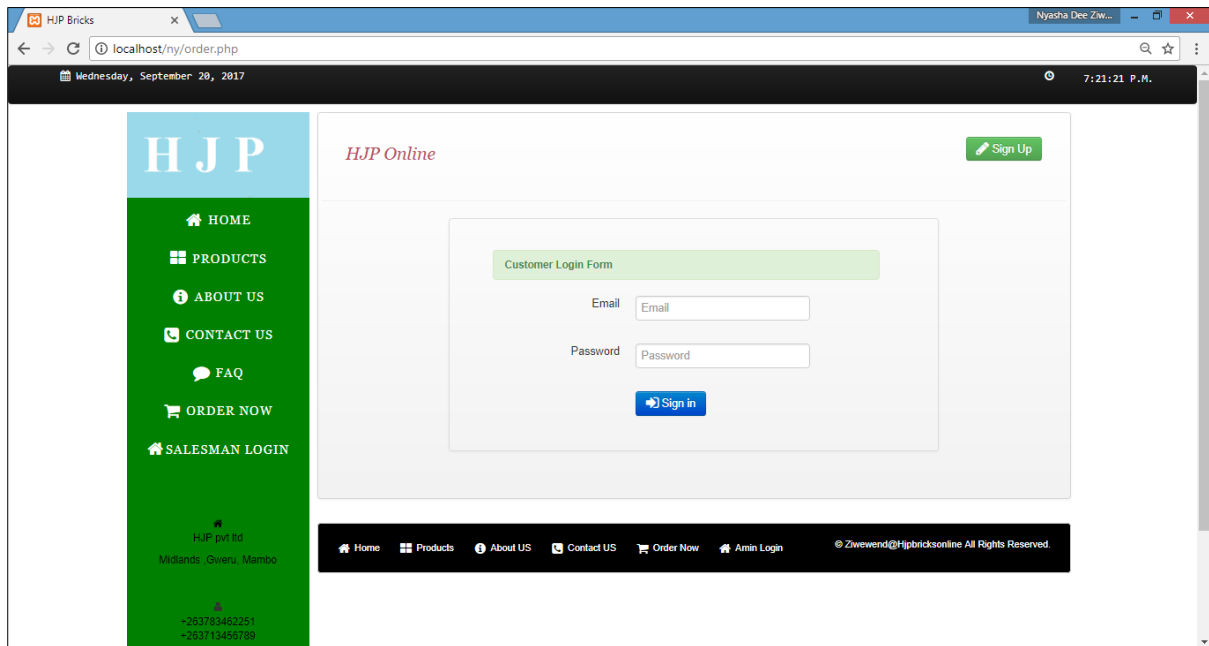
Fig A.2: login page screen shot.

Wrong details

If the user uses a wrong username and or password, the system will generate an error as shown below until the user enters correct password for a specific username:
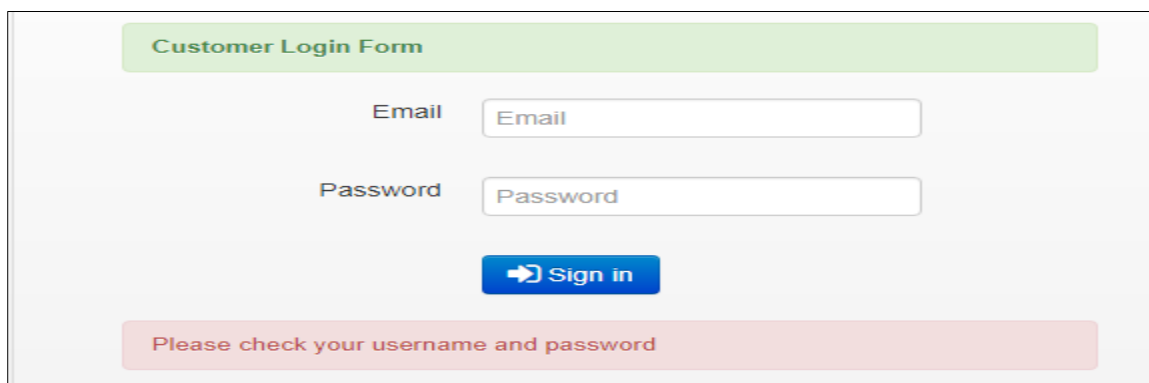
Fig A.3 User checking screen shot

The salesman enters his/her credentials on the fields provided for salesman login while the manager clicks where it is written admin login. When logged in one is transferred to the secured page where he or she can change password, view the records in the database for transactions.
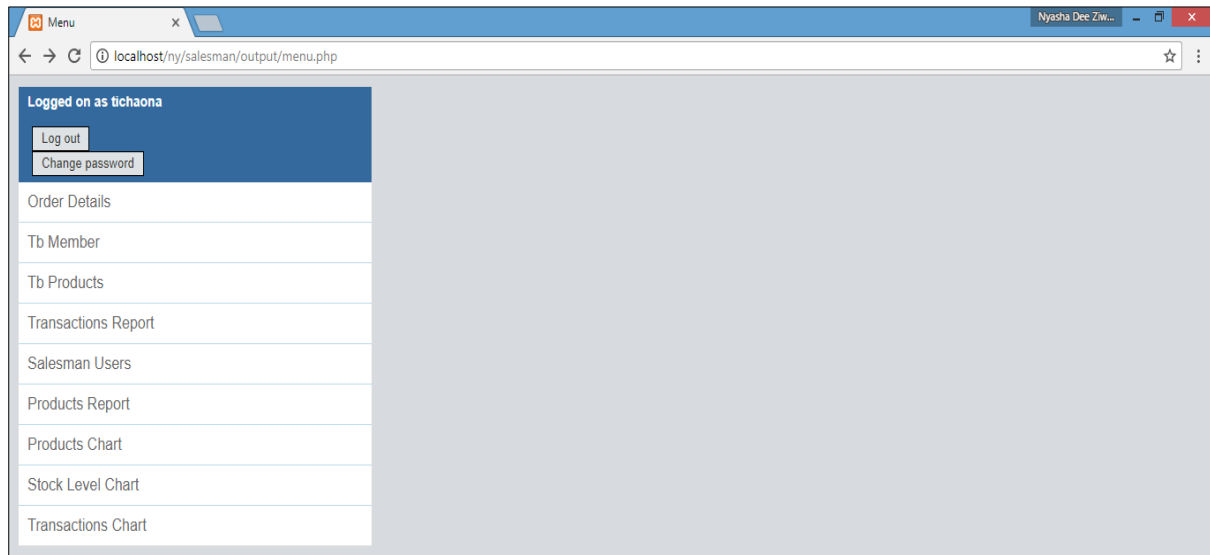
Fig A.4 Salesmen home page

Change password

If one decides to change password valid credentials namely username and old password must be entered and the new password must match the confirm password and the a message will pop up alerting that the password was successfully changed else an error message is shown.
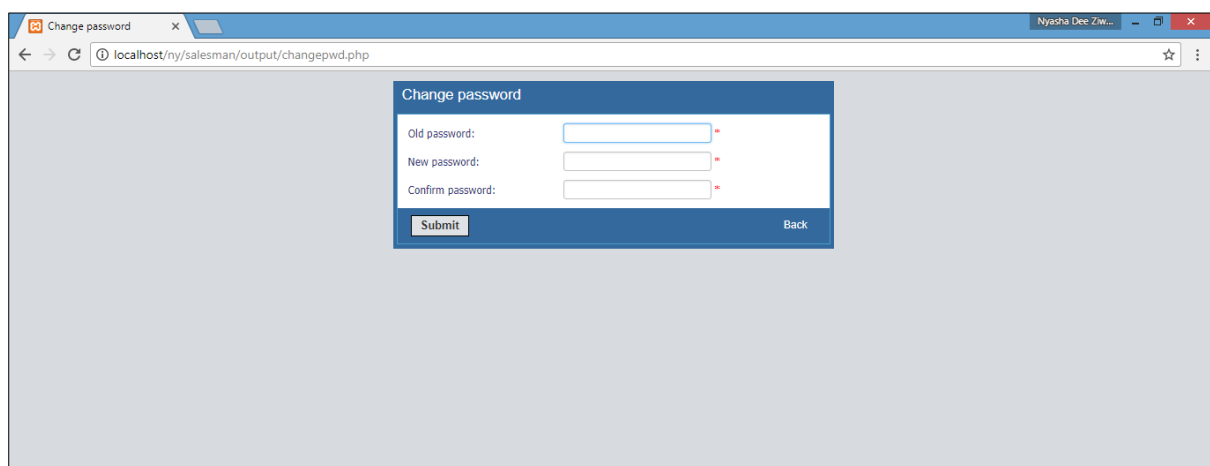
Fig A.5 Change password

Modifying database data

The manager and the salesmen do the rest of their job in their accounts including adding, editing, printing, exporting, importing, searching, deleting. This is shown by fig A.6.
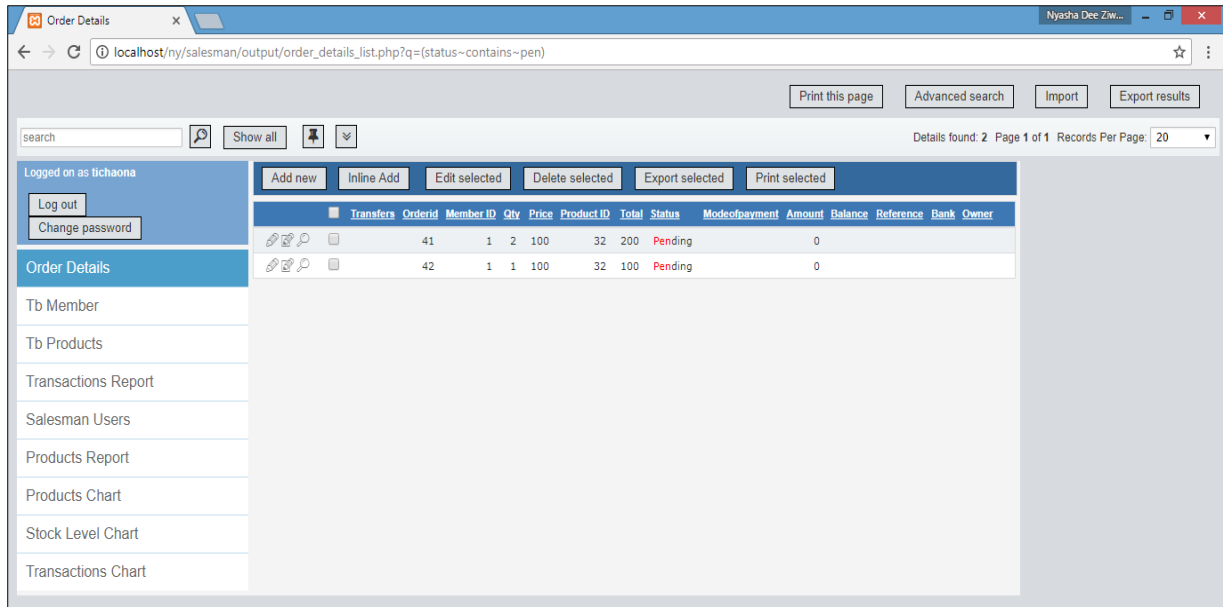
Fig A.6 Database data modification

Adding and editing bricks

The manager can add bricks by just clicking a button named "**Add Products**" and complete the fields requested. To edit the products the manager just click edit and change the necessary fields.
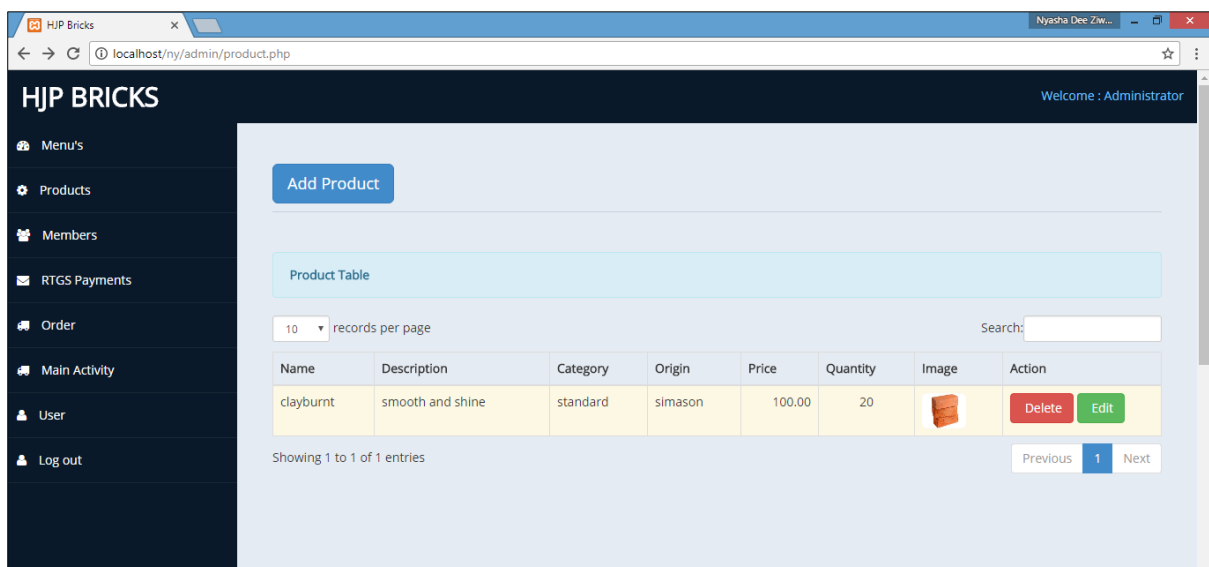
Fig A.7 Adding and editing bricks

Salesmen audit

The manager just click salesman audit and the view details of salesman actions from logging in, deleting, adding and editing showing old and new values and the IP addresses.
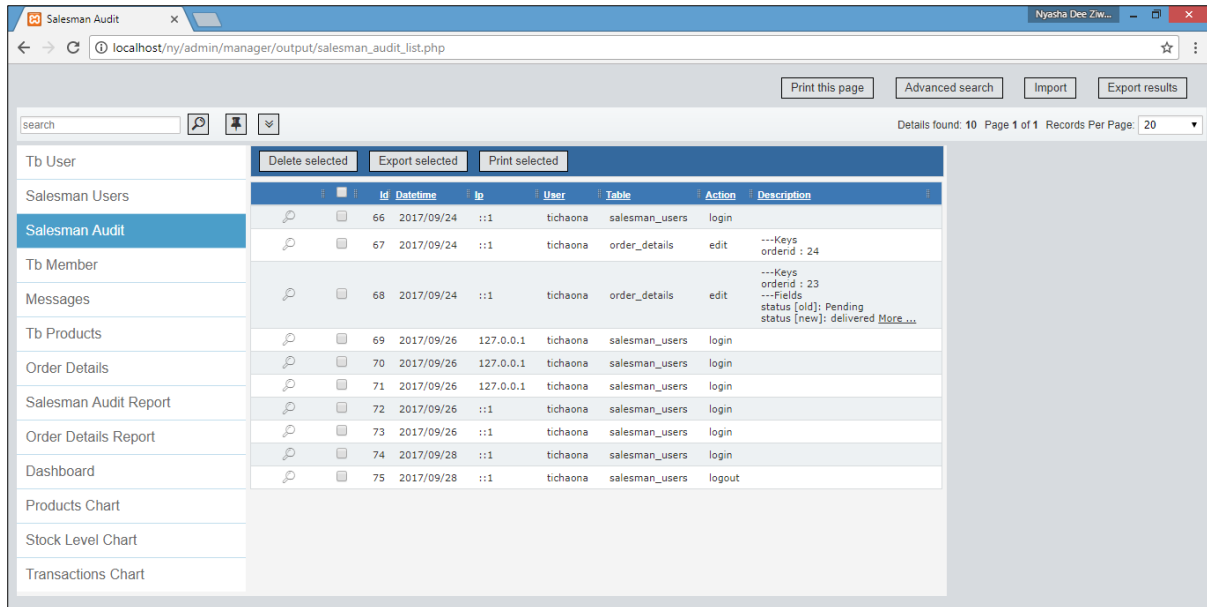
Fig A.8 User auditing screen shot

Exporting data

For exporting data to Microsoft word documents, excel sheets and CSV one has to click where it is written export results on the top right corner. They can also select a few items and export them. The export page is shown in fig A.9
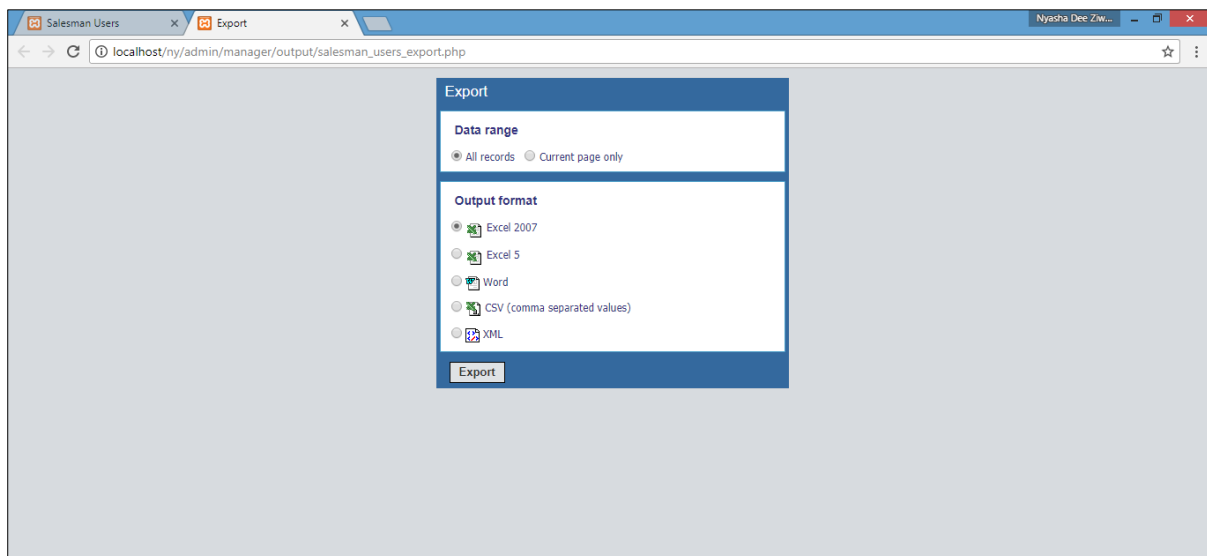
Fig A.9 Exporting data screenshot

Advanced searching

To search type of data the user must click where it is written advanced search and specify the conditions on the advanced search page. Specifications include equals, contains, between, more than, less than and their opposites by checking the NOT checkbox. If between is selected another textbox will appear and a date calendar on the field date.

Fig A.10 Advanced search page

Conclusion

Conclusively, the user manual clearly outlines what shall be done by different groups of users in order to effectively and efficiently use the system. Users must follow what is provided in the user manual and understand then perform various actions. If users face problems they must ask the information technology personnel.

APPENDIX B: INTERVIEW GUIDELINE USED FOR THE RESEARCH

The following are some of the open ended questions faced by organisational members of the HJP Brick Sellers during the interview:

Section 1: Interview details

a) Name of interviewer ………………………………………

b) Department of interviewee ………………………………………

c) Position of the interviewee ………………………………………

Section 2: Interview questions

1. For how long have you been at this organisation?
………………………………………………………………………………….

2. How do you do as an organisation in processing orders?

………………………………………………………………………………….

3. May you briefly explain your system in terms of input, processes and outputs?

………………………………………………………………………………….

4. What are the processes involved in selling bricks?

…………………………………………………………………………………..

5. How long it take to process the information for ordering and purchase?

…………………………………………………………………………………..

6. Is the current system secure and to what extend?

………………………………………………………………………………….

7. Is it a good idea to develop an online ordering system?

…………………………………………………………………………………..

8. Do you think there is a need for improvement and what are your suggestions?

……………………………………………………………………………………

9. How long it take to produce reports?

………………………………………………………………………………….

10. How do you communicate with direct stakeholders and known customers?

………………………………………………………………………………….

11. Are there any repetitive information system related problems at the organisation?

……………………………………………………………………………………

12. What are the modes of payment you accept?

……………………………………………………………………………………

Date……………………../ interviewer's signature……………………………….

APPENDIX C: QUESTIONNAIRE CHECKLIST

QUESTIONNAIRE FOR THE HJP BRICKS ONLINE ORDERING SYSTEM

I am **Ziwewe Nyasha Desire**, a student at the **Midlands State University** doing **Information Systems Honours degree**. One of the requirements in order to attain the degree is a project report with a running software system. This questionnaire is prepared to collect information which will help in the development of the HJP Online ordering system. I kindly request for your positive responses to answer the questions involved. I promise to keep the provided information private and use it only for academic purposes.

1. For how long does it take to process orders……………..... hours

2. What are the various processes involved in the current system

   …………………………………………………………………………

   …………………………………………………………………………

   ………………………………………………………………………….

3. Tick where applicable

   i.   Are you satisfied with the current system? ☐ Ye ☐ No

   ii.   Are you satisfied with the services offered? ☐ Ye ☐ No

   If answer is no, add some reasons and explanation if any.

   …………………………………………………………………….....

   …………………………………………………………………………

4. Are you in favour of the new online ordering system? ☐ Ye ☐ No

   If answer is no, add some reasons and explanation if any.

   …………………………………………………………………………..

   ....…………………………………………………………...

5. What are your expectations in the new system?

   ....

   ....

   ....

6. Are the previous changes done and faced resistance and why if any?

   …………………………………………………………………………

   …………………………………………………………………………

   …………………………………………………………………………

7. Are there any other technologies you wish to be integrated with the new system?

…………………………………………………………………………………………

…………………………………………………………………………………………

8. Do you think the new system will be a competitive tool? ☐ Ye ☐ No

Date …………………….Time…………………. Thank you for your cooperation

APPENTIX E: OBSERVATION SCORE SHEET

Observations

Inputs

………
………
………
………
………
………

Processes

………
………
………
………
………
………

Outputs

………
………
………
………
………
………

Resources used

………
………
………
………

Entities involved

………
………
………
………

Site…………………….. Date …………/…………../…………. Signature…………………

APPENDIX F: SNIPPET OF CODE

The HJP Online ordering system was developed in php language with PHP MySQL technology. The system has many modules with many pages of codes. The system files comprises of hundreds of pages of code. In this document, few code samples are given.

User Login

```php
<?php error_reporting(0); include ('connect.php');
if (isset($_POST['go'])) {
    $username = $_POST['username'];
    $password = $_POST['password'];
    $result = mysql_query("SELECT * FROM tb_user WHERE username =   '$username' AND
password = '$password'") or die(mysql_error());
    $row = mysql_fetch_array($result);
    $numberOfRows = mysql_num_rows($result);
    if ($numberOfRows == 0) {
    echo " <br><center><font color= 'red' size='3'>Please fill up the fields
correctly</center></font>";     }
 else if ($numberOfRows > 0) {
        session_start();
        $_SESSION['id'] = $row['user_id'];
        header("location:product.php");
    }} ?>
```

Add products

```php
    <?php error_reporting(0), include ('connect.php');
if (isset($_POST['go'])) {
    $name = $_POST['name'];
    $description = $_POST['description'];
    $category = $_POST['category'];
    $originated = $_POST['originated'];
    $price = $_POST['price'];
    $quantity = $_POST['quantity'];
    //image
    $image = addslashes(file_get_contents($_FILES['image']['tmp_name']));
    $image_name = addslashes($_FILES['image']['name']);
    $image_size = getimagesize($_FILES['image']['tmp_name']);
    //
    move_uploaded_file($_FILES["image"]["tmp_name"], "upload/" . $_FILES["image"]["name"]);
    $location = "upload/" . $_FILES["image"]["name"];
```

```php
    mysql_query("insert into tb_products
(name,description,category,originated,price,quantity,location)
values
('$name','$description','$category','$originated','$price','$quantity','$location')")
 or die(mysql_error());
    header('location:product.php');
}?>
```

Order

```php
<?php
$query = mysql_query("select * from tb_products") or die(mysql_error());
while ($row = mysql_fetch_array($query)) {
    $id = $row['productID'];
    $qty = $row['quantity'];
    $category = $row['category'];
    $query1 = mysql_query("SELECT *,SUM(qty) as qty FROM order_details WHERE productID =
'$id' AND status = 'Delivered'");
    $row1 = mysql_fetch_array($query1);
    $total_qty = $qty - $row1['qty']; ?>
                                <li class="span3">
                                <div class="thumbnail">
                                <img data-src="holder.js/300x200" alt="">
                                <div class="alert alert-success"><div class="font1"><?php
echo $row['name']; ?></div></div> <hr>
<a  href="#<?php echo $id; ?>"  data-toggle="modal"><img src="admin/<?php echo
$row['location'] ?>" class="img-rounded" alt="" width="180" height="110"></a>
 <p> <a> Price: $<?php echo $row['price']; ?></a></p>
<?php if ($total_qty > 0) { ?>
<a href="#add<?php echo $id; ?>"   data-toggle="modal" class="btn btn-success"><i
class="icon-shopping-cart icon-large"></i> Add to Cart</a>
<?php } else { ?>
<span class="label label-important">Out of Stock</span> <?php } ?>
<?php include ('order_modal.php'); ?> <?php }
if (isset($_POST['order'])) {
    $member_id = $_POST['member_id'];
    $quantity = $_POST['quantity'];
    $price = $_POST['price'];
    $product_id = $_POST['product_id'];
    $total = $quantity * $price;
```

```php
        $category;
    mysql_query("insert into order_details
(memberID,qty,productID,price,total,status,category)
values('$member_id','$quantity','$product_id','$price','$total','Pending','$category')") or
die(mysql_query);
    /* header('location:user_wines.php'); */
?> <script>window.location = 'user_bricks.php';</script> <?php } ?>
<div id="footer"><?php include ('footer_user.php'); ?></div>
```

Dashboard with charts

```php
<?php
require_once (getabspath("classes/cipherer.php"));
$tdataDashboard = array();
$tdataDashboard[".ShortName"] = "Dashboard";
//  field labels
$fieldLabelsDashboard = array();
$pageTitlesDashboard = array();
if (mlang_getcurrentlang() == "English") {
    $fieldLabelsDashboard["English"] = array();
    $fieldLabelsDashboard["English"]["Transactions_Chart_SUM_qty_"] = "Number of Bricks";
    $fieldLabelsDashboard["English"]["Transactions_Chart_category"] = "Category";
    $fieldLabelsDashboard["English"]["Transactions_Chart_SUM_total_"] = "Total Sales";
    $fieldLabelsDashboard["English"]["Transactions_Chart_SUM_amount_"] = "Amount Recieved";
    $fieldLabelsDashboard["English"]["Transactions_Chart_SUM_balance_"] = "Total Balance";
    $fieldLabelsDashboard["English"]["stock_holding_Chart_Bundles"] = "Bundles";
    $fieldLabelsDashboard["English"]["stock_holding_Chart_status"] = "Status";
    $fieldLabelsDashboard["English"]["stock_holding_Chart_balance"] = "Balance"; }
if (mlang_getcurrentlang() == "") {
    $fieldLabelsDashboard[""] = array(); }
//  search fields
$tdataDashboard[".searchFields"] = array();
$dashField = array();
$dashField[] = array("table" => "Transactions Chart", "field" => "SUM(qty)");
$tdataDashboard[".searchFields"]["Transactions_Chart_SUM_qty_"] = $dashField;
$dashField = array();
$dashField[] = array("table" => "Transactions Chart", "field" => "category");
$tdataDashboard[".searchFields"]["Transactions_Chart_category"] = $dashField;
$dashField = array();
```

```php
$dashField[] = array("table" => "Transactions Chart", "field" => "SUM(total)");
$tdataDashboard[".searchFields"]["Transactions_Chart_SUM_total_"] = $dashField;
$dashField = array();
$dashField[] = array("table" => "Transactions Chart", "field" => "SUM(amount)");
$tdataDashboard[".searchFields"]["Transactions_Chart_SUM_amount_"] = $dashField;
$dashField = array();
$dashField[] = array("table" => "Transactions Chart", "field" => "SUM(balance)");
$tdataDashboard[".searchFields"]["Transactions_Chart_SUM_balance_"] = $dashField;
$dashField = array();
$dashField[] = array("table" => "stock holding Chart", "field" => "Bundles");
$tdataDashboard[".searchFields"]["stock_holding_Chart_Bundles"] = $dashField;
$dashField = array();
$dashField[] = array("table" => "stock holding Chart", "field" => "status");
$tdataDashboard[".searchFields"]["stock_holding_Chart_status"] = $dashField;
$dashField = array();
$dashField[] = array("table" => "stock holding Chart", "field" => "balance");
$tdataDashboard[".searchFields"]["stock_holding_Chart_balance"] = $dashField;
// all search fields
$tdataDashboard[".allSearchFields"] = array();
$tdataDashboard[".allSearchFields"][] = "Transactions_Chart_SUM_qty_";
$tdataDashboard[".allSearchFields"][] = "Transactions_Chart_category";
$tdataDashboard[".allSearchFields"][] = "Transactions_Chart_SUM_total_";
$tdataDashboard[".allSearchFields"][] = "Transactions_Chart_SUM_amount_";
$tdataDashboard[".allSearchFields"][] = "Transactions_Chart_SUM_balance_";
$tdataDashboard[".allSearchFields"][] = "stock_holding_Chart_Bundles";
$tdataDashboard[".allSearchFields"][] = "stock_holding_Chart_status";
$tdataDashboard[".allSearchFields"][] = "stock_holding_Chart_balance";
// good like search fields
$tdataDashboard[".googleLikeFields"] = array();
$tdataDashboard[".googleLikeFields"][] = "Transactions_Chart_SUM_qty_";
$tdataDashboard[".googleLikeFields"][] = "Transactions_Chart_category";
$tdataDashboard[".googleLikeFields"][] = "Transactions_Chart_SUM_total_";
$tdataDashboard[".googleLikeFields"][] = "Transactions_Chart_SUM_amount_";
$tdataDashboard[".googleLikeFields"][] = "Transactions_Chart_SUM_balance_";
$tdataDashboard[".googleLikeFields"][] = "stock_holding_Chart_Bundles";
$tdataDashboard[".googleLikeFields"][] = "stock_holding_Chart_status";
$tdataDashboard[".googleLikeFields"][] = "stock_holding_Chart_balance";
$tdataDashboard[".dashElements"] = array();
```

```php
$dbelement = array("elementName" => "Transactions_Chart_chart", "table" => "Transactions Chart", "type" => 1);
$dbelement["cellName"] = "cell_0_1";
$tdataDashboard[".dashElements"][] = $dbelement;
$dbelement = array("elementName" => "stock_holding_Chart_chart", "table" => "stock holding Chart", "type" => 1);
$dbelement["cellName"] = "cell_0_0";
$tdataDashboard[".dashElements"][] = $dbelement;
$tdataDashboard[".shortTableName"] = "Dashboard";
$tdataDashboard[".nType"] = 4;
$tableEvents["Dashboard"] = new eventsBase;
$tdataDashboard[".hasEvents"] = false;
$tdataDashboard[".tableType"] = "dashboard";
$tdataDashboard[".addPageEvents"] = false;
$tables_data["Dashboard"] = & $tdataDashboard;
$field_labels["Dashboard"] = & $fieldLabelsDashboard;
$page_titles["Dashboard"] = & $pageTitlesDashboard;
?>
```

Displaying database data (products)

```php
<?php include ('connect.php');
$query = mysql_query("select * from tb_products") or die(mysql_error());
while ($row = mysql_fetch_array($query)) {$id = $row['productID'];
                                  $query1 = mysql_query("SELECT *,SUM(qty) as qty
FROM order_details WHERE productID = '$id' AND status = 'Delivered'");
                                  $row1 = mysql_fetch_array($query1);
                                  $total=$row['quantity'] - $row1['qty'];
$query2 = mysql_query ("UPDATE product set quantity = '$total' where productID = '$id'");?>
                                  <tr class="warning">
                                  <td><?php echo $row['name']; ?></td>
                                  <td><?php echo $row['description'];?></td>
                                  <td><?php echo $row['category']; ?></td>
<td><?php echo $row['originated']; ?></td>
<td style="text-align:right;"><?php echo number_format($row['price'],2); ?></td>
<td style="text-align:center;"><?php echo $total; ?></td>
<td><a href="<?php echo $row['location'] ?>" target="_blank"><img src="<?php echo
$row['location']; ?>" class="img-rounded" width="50" height="40"></a></td>
<td width="160">
```

```
<a href="#delete_product<?php echo $id; ?>" role="button"  data-target =
"#delete_product<?php echo $id;?>"data-toggle="modal" class="btn btn-danger"><i
class="icon-trash icon-large"></i> Delete</a>
<a href="edit_product.php<?php echo '?id=' . $id; ?>" class="btn btn-success"><i
class="icon-pencil icon-large"></i> Edit</a></td>
<!-- product delete modal --> <?php include ('delete_product_modal.php');?>
<!-- end delete modal --> </tr><?php } ?>  </tbody> </table>
```

HTML design sample (signup page)

```
<div class="modal fade" id="myModal" tabindex="-1" role="dialog" aria-
labelledby="myModalLabel" aria-hidden="true">
<div class="modal-dialog"> <div class="modal-content"> <div class="modal-header">
<div class="alert alert-info"><strong><center>Add Product </center></strong></div></div>
<div class="modal-body"> <form method="post" enctype="multipart/form-data">
<hr><div class="control-group"> <label class="control-label" for="inputEmail">Name:</label>
<input type="text" name="name" class="form-control" placeholder="Name" required></div>
<div class="control-group"> <label class="control-label"
for="inputPassword">Description:</label>
<div class="controls"> <input type="text" class="form-control" name="description"
placeholder="Description" required> </div> </div>
<div class="control-group"> <label class="control-label"
for="inputPassword">Category:</label>
<div class="controls"> <select type="text" name="category" class="form-control"
placeholder="Category">
 <option>block</option>
 <option>standard</option>
<option>timber</option>
</select></div></div>
<div class="control-group"> <label class="control-label"
for="inputPassword">Origin:</label>
<div class="controls">
<input type="text" name="originated" class="form-control" placeholder="Origin" required>
</div></div>
<div class="control-group"> <label class="control-label" for="inputPassword">Price:</label>
<div class="controls"> <input type="number" step="10" name="price" class="form-control"
placeholder="Price" required min="100"></div></div>
<div class="control-group"> <label class="control-label"
for="inputPassword">Quantity:</label>
```

```html
<div class="controls">
<input type="number" name="quantity" placeholder="Quantity" class="form-control" required min="1"></div></div>
<div class="control-group"><label class="control-label" for="input01">Image:</label>
<div class="controls"> <input type="file" name="image" required accept="image/jpeg, image/png"></div></div>
<div class="modal-footer"> <button name="go" class="btn btn-primary">Save</button>
<button type="button" class="btn btn-default" data-dismiss="modal">Close</button>
</div></div></div></form>
```

CSS setting sample

```css
body { background: #fff; font-family: Arial, Helvetica, sans-serif;font-size: 13px;
       line-height: 1; margin: 0; min-width: 960px;padding: 0; }
#background {margin: 0; padding: 0; }
#page { margin: 0 auto; overflow: hidden;padding: 0 10px;width: 1200px;}
#sidebar {background-color: green; float: left; margin: 0 10px 0 0; padding: 0;width: 230px;}
#sidebar a.logo { display: block; margin: 0;padding: 0;}
#sidebar a.logo img {border: 0; display: block; }
#sidebar div { margin: 0; padding: 0;}
#sidebar ul { margin: 0;padding: 0;}
#sidebar ul li {list-style: none; margin: 0;padding: 0;}
#sidebar > ul {padding: 18px 10px 0;}
#sidebar > ul li {height: 20px; margin: 0 0 28px;text-align: center;}
#sidebar > ul li a {color: white; font-family: Georgia, serif; font-size: 16px; height: 22px;letter-spacing: 1px; margin: 0; padding: 0; text-decoration: none; text-transform: uppercase; width: auto;}
#sidebar > ul li a:hover {background-color: green; color: #ebcdd4;}
#sidebar > ul li.selected span {background: url(../images/brace-left.png) no-repeat bottom left; display: inline-block; margin: 0;padding: 0 0 0 20px;}
#sidebar > ul li.selected a {color: #ebcdd4;display: inline-block;padding: 0 20px 0 0;}
#sidebar .contact {background-color;}
#sidebar .contact ul li {padding: 15px 10px;text-align: center;}
#sidebar .contact > ul {padding: 0 0 10px;}
#sidebar .contact ul ul li {color: #000;line-height: 18px;padding: 0;}
#sidebar .contact ul li span {background: url(../images/icons.png) no-repeat; display: block; margin: 0 auto 10px; padding: 0;text-indent: -99999px; width: 21px;}
#sidebar .contact ul li.address span { background-position: -8px -198px; height: 22px;}
```

```css
#sidebar .contact ul li.contactInfo span {background-position: -8px -240px;height: 19px;}
#sidebar .contact ul li.mail span {background-position: -8px -279px;height: 17px;}
#sidebar .contact ul ul li a {color: #7d7c7c;text-decoration: none;}
#sidebar .contact ul ul li a:hover {color: #000;}
#sidebar .connect { background: #202958;padding: 20px 0;}
```